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BIRD-BANDING

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Bird-Banding

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SEVENTEEN YEARS OF BANDING WHITE-THROATED SPARROWS AND SLATE-COLORED JUNCOS AT MICHIGAN STATE COLLEGE[1]

By J. W. Stack and R. L. Harned

Bird-banding was started at Michigan State College on October 12, 1923. On that date the senior author placed the first bird trap on the college campus. It was located in the southeast corner of the Forest Nursery. From this meagre beginning bird-banding operations have expanded. At present as many as thirty bird-catching devices are operated on the campus throughout the spring, winter and fall terms.

Until the fall term of 1925 the senior author was the sole operator of the traps. During that term members of his advanced ornithology class were given an opportunity to handle and band living birds. Interest was thus stimulated and the method proved successful. Since that time bird-banding has been a project of Professor Stack and his classes in advanced ornithology.

The type of trap which has proved most successful and which has been used almost exclusively at this station is the modified government sparrow trap. It was originally designed, after extensive experimental work, by the late W. I. Lyon of Waukegan, Illinois[1].

Another highly successful method of catching birds at this station has been by means of bird trammel nets[2]. This type of net was first used for capturing live birds in Italy, and was introduced into this country for bird-banding purposes by Dr. O. L. Austin. At present about one-half of the bird-catching devices used at this station are nets and one-half traps. The nets are never used when the temperature is below freezing.

In the spring of 1938 sanctuary rights were granted for an area

[1]Journal article No. 544 (n.s.), Michigan State College Experiment Station. Mr. Harned submitted this paper in partial fulfillment of requirements for the degree of Master of Science.

[2]The bird trammel nets are 20′ long by 7′ high; the outside netting is a 10″ square mesh of No. 16 cotton twine; the inside netting is a ¾″ square mesh of No. 50/2 linen. They are hung with No. 24 twine at top through small black metal rings, ¾″ in diameter. The nets are dyed black, this color being least conspicuous.

rather isolated from the rest of the campus. This area affords protection, food, and nesting sites. In the fall of 1938 traps and nets were shifted to this area and have remained so placed until the present time.

The aim of this treatise is to summarize the data obtained from banding White-throated Sparrows (*Zonotrichia albicollis* (Gmel.)) and Slate-colored Juncos (*Junco hyemalis hyemalis* (Linn.)) over a period of seventeen years. These have been selected for study because they are the two species most frequently caught at this station, and relatively little is known of their migration habits. In general they breed in regions north of this area and winter in areas farther south. They are therefore caught at this station while on their migratory routes in spring and fall. This study was made primarily to learn something about the behavior of these birds while moving between winter and summer homes, and *vice versa*. The study has been concerned mainly with gross behavior patterns.

WHITE-THROATED SPARROWS

The White-throated Sparrow is one of the most abundant members of its large family. It breeds from northern Mackenzie and the southern part of the Ungava Peninsula south to southern Montana, north of Clare County in Michigan, northern Pennsylvania and western Massachusetts. The winter range is from the southern part of the nesting area south to the Gulf coast and northeastern Mexico. It is caught at this station in larger numbers than any other bird, except the Slate-colored Junco.

A total of 4,174 White-throated Sparrows were banded during the years of 1924 to 1940, inclusive. Of this number 2,712 were banded during spring migrations and 1,462 during fall migrations. It should be noted that no banding was done during the fall of 1930, therefore, the totals include one more set of spring than fall figures. The actual number banded each spring and fall for the seventeen year period is shown in Table I.

The mean yearly number of birds banded during fall migration period was 91.4. The average number banded during spring periods was 159.5. A difference as great as 68.1 would occur by chance about once out of twenty times. Therefore the difference is statistically significant. It might be expected that greater numbers would be banded during the fall because that period would include not only the mature birds but also the young of the year. Then too it has been shown that the fall migration is more leisurely, that is, it extends over a longer period of time. The average spring migration period is about one week shorter than the average fall

TABLE I

NUMBER OF WHITE-THROATED SPARROWS BANDED DURING SPRING AND FALL MIGRATIONS, 1924 TO 1940, INCLUSIVE

Year	*Spring*	*Fall*
1924	75	39
1925	33	91
1926	122	111
1927	203	87
1928	135	164
1929	236	110
1930	136	...
1931	86	28
1932	170	168
1933	240	60
1934	204	38
1935	198	30
1936	124	148
1937	180	134
1938	202	104
1939	246	105
1940	122	45
Totals	2712	1462

period at this station. Therefore it might seem that this would increase the chances of each bird to be captured and as a result the total catch would be greater during the fall.

It is evident that the above statement presents only one side of the question and that other factors should be considered.

First, since natural food is more abundant during the fall migration season it seems natural to expect that fewer birds would be attracted to artificial baits during that period. Therefore it is probable that a greater catch would be realized during the spring period which usually begins around April 20 and ends about May 20.

Second, contrary to popular opinion, not all species of birds seem to follow the same migration routes from year to year or even the same ones in spring and fall. Especially does this seem to be true for the White-throated Sparrow. According to all information at hand, at stations between winter and summer homes, local return records for this species are rare. The only information which has been obtained about an individual of this species, banded at this station, came from Eldorado, Arkansas. This bird was banded at Michigan State College, April 27, 1927, and was shot by T. Mooty at Eldorado in November 1929. It was evidently on migration or at its winter home. Since return records are so scarce, even though large numbers are caught each year, it is possible that individual migration routes vary yearly and even seasonally. It is entirely possible that first-year birds and parents follow separate routes in the fall migration.

A bird which is recaptured at the same station within a period of six months after the date of the last previous capture is called a repeat. This terminology is based on the theory that if only a short period elapses between captures it is probable that the bird has remained relatively close to the station between these times. The period of six months has been fixed arbitrarily to correspond with the length of the summer and winter seasons. If a period of time greater than six months elapses between catches, the bird is classified as a local return.

A great many things may be learned from studying the repeats of birds. The length of stop-over periods along the migration route, the tendency of species to form the trap-habit method of feeding, the length of time elapsing between repeats, the comparison between the repeat records of different species and between individuals of the came species, are all problems which may be studied from repeat records.

The average percentage of repeats during spring migrations was found to be 24 $\pm$ 14.5 (standard dividations. Baten, 1938). The corresponding average for fall migrations was 63.3, 15.6%. The odds against this difference being due to chance are 19 to 1. Therefore this difference is considered significant. Bradt (1926), whose results were based on banding results for only one year, did not find a significant difference between the number of repeats in spring and fall.

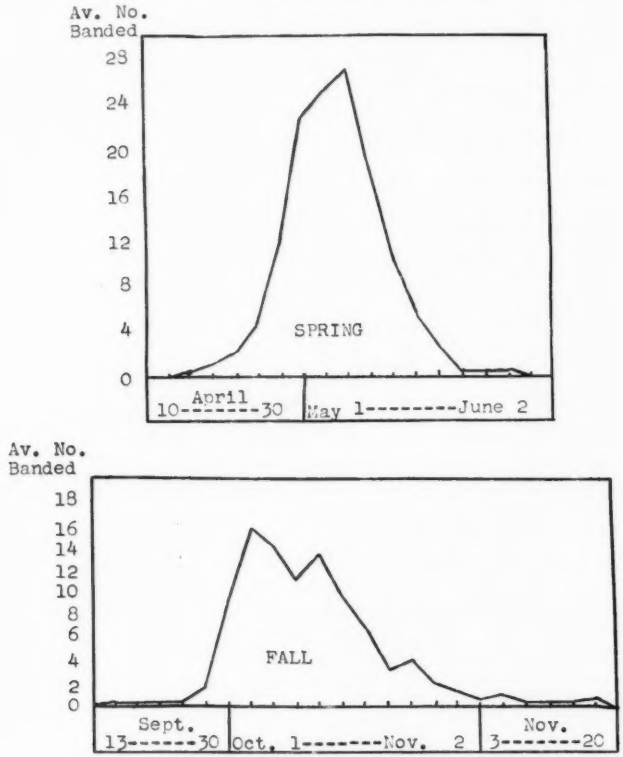
The difference shown in this work is probably due to the fact that migration in the fall is more leisurely. According to Rowan (1931) a greater speed of migration in the spring is due to a strong urge for mating and reproduction. This urge is attributed to a rejuvenation of the dormant sexual organs, which in turn are stimulated by the increasing length of light-days and an increasing amount of daily exercise. After termination of the breeding period these organs again degenerate. The urge therefore not being present in the fall would cause migration to be less rapid.

The average length of time spent in this locality was found to be significantly greater in the fall than in the spring. The average stop-over period in the fall is 10.67 $\pm$ 2.56 days. The corresponding period for spring is 4.5 $\pm$ 1.56 days. This difference would occur through chance about once in twenty times. These results show definitely that migration in the fall is less rapid than in the spring.

It is difficult to say that a migration reaches its greatest intensity on any one specific day because the numbers caught on succeeding days may vary greatly. In order to show a somewhat smoother migration curve and still give the impression of the fluctuation tendency it seems better for all practical purposes to group the

number of birds banded into two or three-day periods. For this work a three-day period has been adopted.

Graph I presents the spring and fall migration curves for White-throated Sparrows. Each point on the curves is the average number



GRAPH I

AVERAGE SPRING AND FALL MIGRATION CURVES FOR WHITE-THROATED SPARROWS (1924 to 1939)

of birds banded on three successive days over a period of sixteen years, 1924 to 1940, inclusive. These curves may be used in the future as standards for comparison with curves for individual years. An inspection of these graphs leads to the following general con-

clusions concerning spring and fall migrations of White-throated Sparrows at East Lansing:

1. The bulk of spring migration occurs between the nineteenth and twenty-first of April and the nineteenth and twenty-first of May, a period of thirty-three days.
2. The average spring migration peak falls between the seventh and ninth of May.
3. The bulk of fall migration comes between the twenty-fifth and twenty-seventh of September and the twenty-fifth and twenty-seventh of October, a period of thirty-three days.
4. The average fall migration peak occurs between the first and third of October.
5. After the peak is reached, migration terminates in less time and the slope is more abrupt during the spring than during the fall migration. This further supports the theory that there is a definite urge in the spring to reach breeding grounds. This urge is non-existent in the fall and migration is more irregular.
6. The difference between the numbers banded in spring and fall is clearly shown.

The first and last captures of birds for both spring and fall migration seasons are of particular interest.

The earliest date of arrival recorded in the spring for a White-throated Sparrow is April 17th, and the latest April 30th. The average date for the sixteen years is April 23 $\pm$ 3.5 days. The earliest departure date recorded for spring is May 8th, and the last May 19th $\pm$ 4.5 days.

It was not possible in this study to consider first arrivals in the fall because, in most of the years covered, migration had already begun before college was opened and the traps put into operation. The earliest date of capture in the fall was October 13th, and the last date of capture November 8th. The average date of last capture in the fall is between October 27th and 28th $\pm$ 7 days. It is seen that the fall migration extends over a considerably longer period than the spring.

SLATE-COLORED JUNCO

The Slate-colored Junco comes at a time when most of the other birds have left for their winter homes in the south, and usually remains until late in the fall. It breeds in the Hudsonian and Canadian Zones in northwestern Alaska, northern Mackenzie (the tree-limit of North America), northern Manitoba, central Quebec, south to the base of the Alaskan peninsula, southern Yukon, central Alberta, northern Minnesota, central Michigan, Ontario, and the

mountains of New York, Pennsylvania, and western Massachusetts. Its winters are spent in the eastern United States, southern Ontario, and south to the Gulf Coast. These birds are banded at this station in greater numbers than any other species. They are taken almost entirely during their migratory periods since relatively few remain in this locality throughout the winter months. For the period of 1924 to 1940, inclusive, 5369 were banded. If the total number of repeats were added to this, the number of catches would approximate 12,000.

The numbers banded by years and seasons are shown in Table II. Of the total number banded, 2236 were taken during spring migrations and 3133 during fall migrations. The mean number for the spring was 131.5 $\pm$ 86.6. The average in the corresponding fall migrations was 195.8 $\pm$ 100. The difference between the two means, 64.3, is not significant since it would occur through chance about once in five times.

One explanation for this dissimilarity is that in some years spring migration begins before traps are opened. The beginning of spring trapping corresponds roughly to the opening dates of the spring term. The beginning of trapping operations has therefore varied from April 4th to 16th during the past sixteen years. This variation would make a considerable difference in the number captured, since the maximum migration period often falls from April 7th to 12th. It is also difficult to determine the actual start of migration at this station because occasionally individuals do winter in this area. Records from students doing special problems during the winter terms show that a few Slate-colored Juncos are caught throughout the winter months. Bradt (1926) found spring migration beginning around April 9th in 1926.

Another probable theory to account for the difference is that in spring the migration is usually more rapid than in the fall. It might be that when favorable weather prevails in the spring, birds make a series of longer, non-stop flights until they reach their destination in the north. Stop-overs during fall migrations would be made oftener and for greater periods of time, and the chances for individuals to be caught would be greater. If this is true, it would seem partially to account for the smaller number banded in the spring.

An examination of Table II reveals an interesting point. The total number of Juncos caught during spring and fall migrations after 1932 is almost equal. Then why is the difference only before 1932? It is noteworthy that bird trammel nets were first employed as a supplementary method of capturing birds in 1933. It may be that this factor has played an as yet unrevealed influence in the

change. A more likely reason, however, would seem to be that captures of Slate-colored Juncos have always been relatively heavy in the fall.

TABLE II

NUMBER OF SLATE-COLORED JUNCOS BANDED DURING SPRING AND FALL MIGRATIONS, 1924 TO 1940, INCLUSIVE

Year	*Spring*	*Fall*
1924	6	153
1925	7	199
1926	88	330
1927	52	151
1928	280	285
1929	119	335
1930	151	...
1931	17	78
1932	223	368
1933	146	155
1934	249	155
1935	252	215
1936	105	71
1937	137	131
1938	318	266
1939	146	185
1940	43	36
Totals	2236	3133

Several interesting things about the behavior of Slate-colored Juncos in migration can be learned from a study of their repeating habits. The repeats of these birds, that is, within a period of six months after original captures, show the length of their stop-overs and the relative tendency to repeat.

The percent of repeats is the total number banded divided by the number of repeats, times one hundred. The difference between the percentages of repeats during the two migration seasons was found to be insignificant. The average percent of repeats during fall migrations was 42.6 $\pm$ 19.4. The average during the spring periods was 29.6 $\pm$ 16.5%. The actual difference (13.1%) would occur through chance approximately once in three times.

The percent of spring repeats for Slate-colored Juncos (29.6) is slightly greater than spring repeats for White-throated Sparrows (24.6) but the difference is not significant. The percent of fall repeats for White-throated Sparrows (63.3) was found to be significantly greater than the percent for fall repeats for Slate-colored Juncos (42.6). The difference would arise from chance once in about twenty times. This indicates a greater tendency for White-throated Sparrows to form the trap habit during the fall migration.

The difference between the average length of stop-overs in spring and fall was found to be insignificant. The average length of stay

for Slate-colored Juncos that repeated in the fall was found to be 13.6 days ± 3.2 days, and the average for those that repeated in the spring was 9.7 days ± 3.1 days. The difference would occur through chance about once in twenty times. This difference is particularly significant in this instance, since it shows that migration in the fall is more leisurely than in the spring.

The question of whether or not birds follow the same migration routes in different seasons has been long debated. The chance that the same bird will return to exactly the same banding station on its migratory route, usually hundreds of miles in extent, seems extremely small. Fourteen return records have been recorded for Slate-colored Juncos banded at this station. These records furnish the only evidence that the birds follow the same routes during different seasons.

Table III is a record of returns. It may be noted that nine of the records are of birds banded originally during the fall migrations. All were recaptured during the succeeding spring migrations. Only one of the birds, number B19,537, returned in any subsequent migration. This bird returned twice and is the only Slate-colored Junco coming back more than once to this station. The records of birds bearing bands numbered 34-6962, 34-6963, 34-6964, H90910, and H19537 are particularly interesting. Birds with the first three numbers were caught on the same day, October 24, 1936. Two of the three were retaken again the following spring on the *same* day, April 14, 1937. The third was recaptured only two days earlier, April 12. Birds with band numbers H90903 and H90910 were both originally caught on October 30, 1934 and both returned the same day, April 6, of the following spring. These examples are noteworthy because they raise an interesting question. Do Slate-colored Juncos remain in flocks throughout the winter? It is indicated from these records that they may remain thus united. This is even more amazing when one thinks of the many hazards of migration. It is not evident, however, whether this is a rule or true only in exceptional instances.

Two birds, A89923, and B19302, were banded while traveling north in spring migration and returned to our station the following fall during their flight south. The greatest period of time elapsing between captures for a returned bird (C30,207) is approximately three years.

The two most salient points shown by these return records are: (1) only one return record for this species has been recorded in which the length of time between dates of capture is greater than one year; and (2) an indication of a close flocking tendency is shown throughout the winter months.

TABLE III

RETURN RECORDS FOR SLATE-COLORED JUNCOS BANDED AT THIS STATION (1924–1939)

Band Number	*Original Capture*	*Return*
34-6962	October 24, 1936	April 14, 1937
34-6963	October 24, 1936	April 14, 1937
34-6964	October 24, 1936	April 12, 1937
C30,343	October 5, 1932	April 19, 1933
F78,312	October 14, 1932	April 11, 1933
F79,290	October 19, 1937	April 8, 1938
H90,903	October 30, 1934	April 6, 1935
H90,910	October 30, 1934	April 6, 1935
B19,537	October 2, 1929	March 27, 1930 April 18, 1931
A89,923	April 6, 1927	November 11, 1927
B19,302	April 27, 1928	November 4, 1928
C30,207	October 27, 1929	October 6, 1932
A92,232	October 9, 1928	October 3, 1929
B20,662	April 15, 1928	April 12, 1929

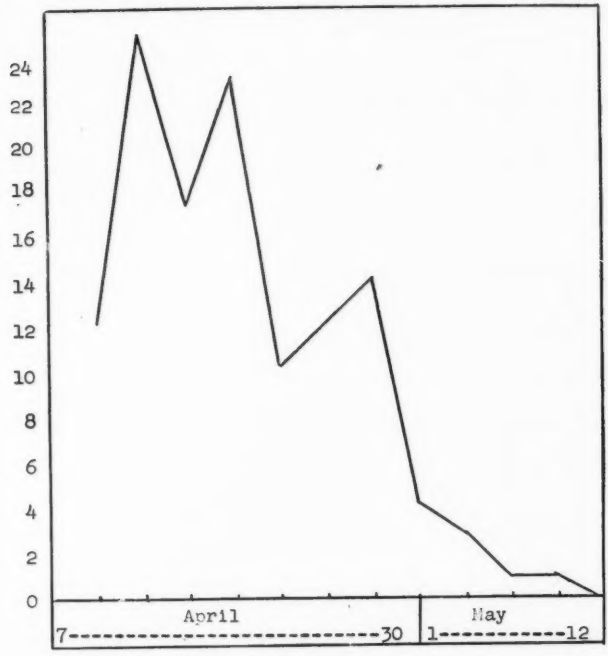
Considerable time has been devoted to the study of migration curves of Slate-colored Juncos at the Michigan State College Station. These birds attracted early attention at the station because of their arrival in large numbers and because of their unusual spring and fall migration habits. The records of bandings cover the years 1924 to 1939, inclusive, and form the basis for a study of migration peaks as well as duration of the migration seasons.

While the larger number of spring migration curves showed a clearly defined migration peak, it was noted that some of them illustrated the fact that migration was already in progress at the time the collection of data was begun. From these graphs it would be difficult to determine whether or not the peak of migration was reached before or after the beginning of trapping operations. For some of the years, 1924, 1925, 1926, 1927, and 1931, the number of birds banded was small, and definite curves were not shown.

During the years 1932, 1933, 1934, 1935, 1936, and 1937, definite peaks appeared some time after the opening dates. These peak-dates ranged from the earliest, April 10 to 12, in 1932 and 1934, to the latest, April 25 to 27 in 1936. In two different years the peak occurred from April 10 to 12. This is the only instance in which the peak occurred on the same date for more than one year. Graph II shows the average percents of the total number banded for these years in which a definite peak is shown, after the traps were opened, *i.e.*, 1932–37, inclusive. It may be seen from this curve that for these years the average peak is from April 10 to 12.

The number of birds banded in the fall during the first three-day period is seldom more than two or three. We are therefore fortu-

nate in having an almost complete set of fall migration records. The maximum period of fall migration was most frequently found to be from October 16 to 18. The peak was from October 7 to 9



GRAPH II

AVERAGE SPRING MIGRATION CURVE FOR SLATE-COLORED JUNCOS CHARTED BY THE PERCENT OF TOTAL NUMBER BANDED[1] (1932–1937)[2]

during the years 1924, 1929, and 1930. For two years the period of maximum movement occurred from October 10 to 12. In the five years 1926, 1932, 1935, 1936, and 1939 (33% of the total number of years) the peak came from October 16 to 18. The peak for 1933 was reached between October 19 and October 21. The

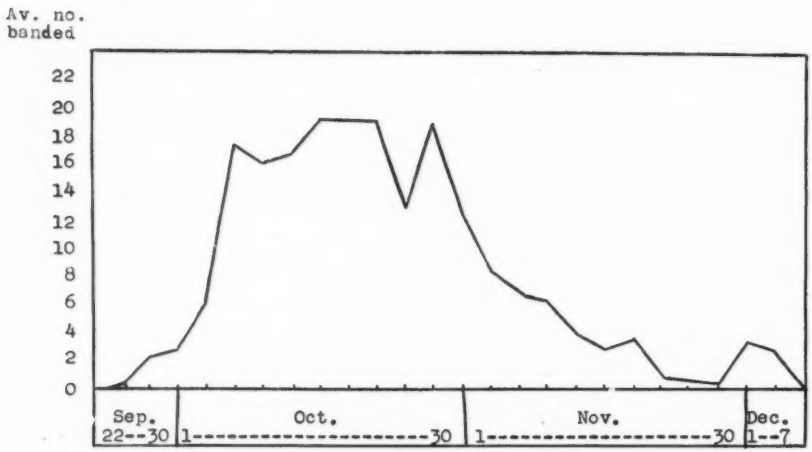
[1]Total number banded is 863.

[2]These years are the only ones for which complete information is available.

fall of 1937 the period of greatest intensity was from October 22 to 24; and the peaks in 1925 and 1934 fell from October 28 to 30.

Graph III presents the fall migration curve for Slate-colored Juncos. Each point on the curve is the average number of birds banded on three successive days over a period of sixteen years, 1924 to 1939. This curve and the curve presented in Graph II, showing the average percent of total numbers banded, may be used in the future as standards of comparison with curves for individual years.

Inspection of these curves leads to the following general conclusions concerning the spring and fall migrations for Slate-colored Juncos:



GRAPH III

AVERAGE FALL MIGRATION CURVE FOR SLATE-COLORED JUNCOS
(1924–1939)

1. The fall migration lasts longer than the spring migration. This assumption is based on evidence that spring migration begins usually around April 9. The difference is primarily due to a more leisurely passage in the fall than in the spring.
2. The period of maximum intensity is much longer in the fall than in the spring.
3. Some birds spend their entire winters in this area. This is indicated by the fact that individuals are captured as long as

the traps are operated in the fall and is further supported by records of students conducting special banding studies in the winter term.

4. The curves are very irregular. This is probably due to the relatively irregular migratory habits of this species.

SUMMARY

1. A greater number of Slate-colored Juncos is banded during fall than during the spring. The differences, however, are not significant.

2. A significantly greater percent of repeats for White-throated Sparrows occurs in fall than in spring.

3. There is a greater percent of repeats for Slate-colored Juncos in the fall than in the spring.

4. Stop-over periods are significantly longer for both White-throated Sparrows and Slate-colored Juncos in the fall than in the spring.

5. The average peak of spring migration for White-throated Sparrows is from May 7 to 9.

6. The period of greatest banding activity for Slate-colored Juncos during spring migrations is April 10 to 12.

7. The average peak of fall migrations for White-throated Sparrows is from October 1 to 3.

8. The greatest number of fall migration peaks for Slate-colored Juncos was recorded for October 16 to 18.

9. The average spring migratory period for White-throated Sparrows is April 23 $\pm$ 4 days, to May 19 $\pm$ 4.5 days, or a period of 27 $\pm$ 8.5 days.

10. It was impossible to determine average first-capture dates in the fall for White-throated Sparrows since migration usually begins before traps are opened. The average date of last capture in the fall for this species was found to be between October 27 and 28 $\pm$ 7 days. First banding records at this station range from September 16 to 30. Using September 23 as the median date, fall migration lasts a minimum of 35 days.

11. It was impossible to determine exact beginning dates for spring migrations or closing dates of corresponding fall periods for Slate-colored Juncos. Migration usually begins in the spring before traps are set. The minimum date for first records at this station is approximately April 9. The average date for last records in the spring is approximately April 30. The minimum spring period is therefore 21 days.

12. The termination of fall migration is not well defined for Slate-colored Juncos since a few are taken as long as traps are open in the

winter. Some of them evidently winter in this region. Migration begins at about October 1 and appears to be over at approximately November 20. Thus the period of fall migration is about 50 days.

13. In general, fall migration covers a greater period of time and is less regular than the corresponding spring period. This is true for both Slate-colored Juncos and White-throated Sparrows.

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Department of Zoology, Michigan State College, East Lansing, Michigan.

WINTER RETURNS OF SLATE-COLORED JUNCO AT NORRISTOWN, PENNSYLVANIA

By RAYMOND J. MIDDLETON

SLATE-COLORED JUNCOS (*Junco hyemalis hyemalis* (Linn.)) are common winter residents of the countryside surrounding Philadelphia. They arrive at Norristown which is some eighteen miles north of Philadelphia, about October 1st and are present until the last of April; we have only one May record, the 7th in 1940.

Our banding station which is on the edge of a well-built up community with open fields beyond and around three sides is composed of a small deciduous woods, a white pine grove, many thickets and lawn, about five acres in all.

The first flocks to arrive in autumn are rather restless and roving, here one day and missing the next; one has the feeling they are merely transients and must soon press on; when trapped at this time nearly all are taken where water is used as bait. This continues through October and it is only after the fall migration has about ceased and the colder weather of November comes that they begin to show any interest in traps where small grains are used as bait.

Rarely do any of the October birds repeat in the traps and never do we get any returns from them in subsequent years. One may

assume that the first fall arrivals of this species are probably those that started the southward journey first and will continue to lead the migration parade all down the line to the southern limit of their winter range. Likewise in late spring when those that remained here to winter move north as milder temperatures prevail, again we have those late flocks coming through, among them we capture an occasional one of the early fall arrivals from the previous season. These are not included in the tables of returned birds, only those that were taken from one winter to another are so classed.

Juncos roam over all the neighboring farming country and some may remain in the general vicinity throughout the winter without again visiting the traps unless a snowfall covers their natural food supply. When one leaves out the early fall arrivals and also disregard the late spring flocks one finds that the general winter group is here between the middle of November and April 1st, a period of four and a half months. There are a few individuals that become consistent repeaters in the traps and may remain through part of April but the main winter group is nearly all gone early in the month.

We have only nineteen birds that the records prove were present over one hundred days; all were banded in late November or early December, the longest record being 148 days, two having remained for this length of time.

One should always keep in mind that an early or very late snowstorm and a heavy average snowfall not only increases the winter's total capture but may bring the birds in near the traps from nearby fields earlier and also keep them here later than normal.

Before going over the records of those banded each winter and the lists of returned birds a short description of our outfit of traps is in order. When our station was established in July of 1921 we had one government sparrow trap. We continued with this one trap for seven years and in 1928 about 20 traps of three types were constructed and put in use. From then till now more have been added from time to time and at present we have 60 in operation; these are of six different types and about half have water in motion for bait while the balance have small grains that are suitable for the seed-eating birds.

The following table lists the total number of birds banded in each of the months for the period from July, 1921 to July, 1941; it also lists the number of returns taken from each of the monthly totals as well as the months that the returned birds came back in:

	Total Banded	*Total Returns*	*Monthly Returns*
September	1	none	none
October	89	none	none
November	228	9	8

December	366	44	23
January	307	37	47
February	245	25	35
March	225	11	13
April	90	1	1
May	1	none	none

From this table we find that the October banded birds yielded no returns, the November birds gave a 4% return, the December birds gave a 12% return, the January birds gave a 11.75% return, the February birds gave a 10.2% return, the March birds gave a 4.9% return while the April birds only 1.1% return.

The following résumé gives the number of birds banded in each winter as well as the number of returned birds taken in succeeding winters:

1921 & 22— 7 banded, none returned.
1922 & 23— 1 banded, this returned in 1924–25, 1927–28 and 1928–29.
1923 & 24— 21 banded, 1 returned in 1924–25 and 1 in 1926–27.
1924 & 25— 33 banded, 1 returned in 1925–26.
1925 & 26— 16 banded, none returned.
1926 & 27— 15 banded, 1 returned in 1929–30.
1927 & 28— 33 banded, 5 returned in 1928–29, 5 in 1929–30, 2 in 1930–31.
1928 & 29— 76 banded, 2 returned in 1929–30, 1 in 1930–31, 1 in 1931–32, 2 in 1932–33, 2 in 1933–34.
1929 & 30— 72 banded, 1 returned in each of the succeeding 5 winters, the same individual each year.
1930 & 31— 84 banded, 1 returned in 1931–32, 1 in 1932–33, 1 in 1933–34.
1931 & 32—127 banded, 7 returned in 1932–33, 2 in 1933–34, 3 in 1934–35, 3 in 1935–36.
1932 & 33—173 banded, 6 returned in 1933–34, 3 in 1934–35, 3 in 1935–36, 1 in 1936–37.
1933 & 34—199 banded, 8 returned in 1934–35, 5 in 1935–36, 4 in 1936–37, 1 in 1937–38, 1 in 1938–39, 1 in 1941–42.
1934 & 35—102 banded, 6 returned in 1935–36, 3 in 1936–37, 2 in 1937–38. 1 in 1938–39, 1 in 1940–41.
1935 & 36—162 banded, 1 returned in 1936–37, 1 in 1937–38, 1 in 1938–39, 1 in 1939–40.
1936 & 37— 78 banded, 1 returned in 1937–38, 1 in 1938–39.
1937 & 38— 55 banded, 4 returned in 1938–39, 3 in 1939–40, 1 in 1940–41, 1 in 1941–42.
1938 & 39— 80 banded, 3 returned in 1939–40, 2 in 1940–41, 2 in 1941–42.
1939 & 40—137 banded, 3 returned in 1940–41, 5 returned in 1941–42.
1940 & 41— 89 banded, 1 returned in 1941–42.

Thus we find in twenty years 1560 were banded, of these 80 individuals returned to the station in later years, the return percentage being 5.12. It must be kept in mind that those birds banded in the last three winters will probably bring in many returns during the coming three or four winters so that the return percentage is really not a final figure.

The 80 birds that returned also came back in later winters to the

total of 47 times in all. By adding the returned birds that were present each year to the newly banded birds and using this figure to compare the total of 127 actual times they returned we have a percentage return of 7.5.

The following table gives the return records of the 80 birds in later years after they came back for their first time:

80 returned once—of these 28 returned a second year or 35%.
28 returned two years—of these 13 returned three years or 46.4%.
13 returned three years—of these 4 returned 4 years or 31%.
4 returned four years—of these 2 returned 5 years or 50%.

In the twenty years we captured one bird banded elsewhere, on March 15th after having been banded at Belchertown, Massachusetts on the previous November 11th.

Also one banded here on April 3rd was taken by another bander at Rahway, New Jersey, five days later.

Of the 80 birds that returned in later years we find a number of them did not come back the next year after the winter in which they were banded:

20 did not return until two years after being banded.
6 did not return until three years after being banded.
1 did not return until five years after being banded.

The records of the following individuals seem worthy of mention:

31015—banded.....December 6, 1922
returned 1 on January 27, 1925
" 2 on December 22, 1927
" 3 on February 7, 1929
A122801—banded.....November 27, 1928
returned 1 on December 25, 1929
" 2 on March 23, 1931
" 3 on March 10, 1932
" 4 on November 16, 1933
B170269—banded.....January 7, 1932
returned 1 on December 26, 1932
" 2 on November 28, 1933
" 3 on January 14, 1935
" 4 on December 25, 1935
C35309—banded.....December 1, 1929
returned 1 on January 25, 1932
" 2 on February 5, 1933
" 3 on February 9, 1934
" 4 on February 22, 1935
" 5 on January 21, 1936
L73047—banded.....February 16, 1934
returned 1 on February 5, 1935
" 2 on December 27, 1935
" 3 on February 16, 1937
" 4 on March 27, 1938
" 5 on January 21, 1939
34-53865—banded.....December 9, 1934
returned 1 on January 23, 1936
" 2 on January 16, 1941

SUMMARY

The absence of any return records of the first groups to arrive in the fall and the last to depart northward in spring is evidence that these are entirely migratory and do not winter in this area.

Those banded in December, January and February give the highest return percentages.

The amount of snowfall determines the winter's total of birds that will enter the traps.

Very few remain in this area over 100 days in any winter.

Most of the returned birds are taken during January and February.

Those that came back here a second year yield a much higher rate of return for future years than newly banded birds.

Our return records prove that some lived to the following ages:

80 reached the age of 2 years
28 " " " " 3 "
13 " " " " 4 "
4 " " " " 5 "
2 " " " " nearly 7 years

Norristown, Pennsylvania.

ADDITIONAL RETURNS AND RECOVERIES OF THE SNOW BUNTING

By OSCAR MCKINLEY BRYENS

SINCE writing up my returns of the Snow Bunting (*Plectrophenax nivalis nivalis* (Linn.)) for the winter of 1932–33, which appeared in *Bird-Banding*, Oct. 1933, page 206, many more have been recovered and are given below. A few of those listed in past reports have been retaken since that time, and all of the return dates are given.

The additional returns are as follows:

Band Number	*Date Banded*	*Returning Dates*	
B80275	February 28, 1929	January 21, 1931	
		February 19, 1933	Return—2
		January 20, 1934	Return—3
B160566	February 4, 1932	January 18, 1935	
B160580	March 7, 1932	March 3, 1933	
		February 13, 1934	Return—2
B160582	March 8, 1932	January 20, 1934	
B160591	March 11, 1932	February 5, 1933	
		February 23, 1934	Return—2
C98315	January 31, 1931	March 17, 1932	
		February 5, 1933	Return—2
		February 1, 1934	Return—3

C98334	March 3, 1931	January 12, 1936	Return—4
C98341	March 10, 1931	January 28, 1934	
H41847	February 13, 1933	February 23, 1934	
H41859	February 14, 1933	March 1, 1934	
H41866	February 14, 1933	January 15, 1936	
		February 23, 1934	
H41881	February 15, 1933		
H81223	March 9, 1933	January 29, 1934	
H81268	March 24, 1933	February 25, 1934	
L67404	January 3, 1934	February 22, 1934	
L67405	January 3, 1934	January 18, 1936	
L67423	January 20, 1934	January 31, 1936	
L67432	January 27, 1934	February 3, 1936	
L73506	February 3, 1934	February 3, 1936	
L73509	February 4, 1934	February 2, 1936	
L73511	February 4, 1934	January 25, 1936	
L73514	February 6, 1934	January 23, 1936	
L73527	February 22, 1934	January 25, 1936	
		January 13, 1936	
		January 27, 1938	Return—2
		February 15, 1941	Return—3
34-17563	December 31, 1934	February 11, 1942	Return—4
		January 18, 1936	
34-17565	January 18, 1935	January 27, 1938	Return—2
34-17570	January 20, 1935	February 11, 1937	
34-17571	January 22, 1935	January 25, 1936	
34-17574	January 25, 1935	January 31, 1936	
34-17578	January 26, 1935	January 18, 1936	
34-17579	January 26, 1935	January 18, 1936	
34-17583	January 31, 1935	January 14, 1936	
34-17585	February 2, 1935	March 27, 1937	
34-17589	February 7, 1935	January 19, 1936	
34-17594	February 20, 1935	January 18, 1936	
34-97142	January 15, 1936	January 18, 1936	
34-97155	January 18, 1936	February 26, 1938	
36-19368	February 27, 1936	February 13, 1938	
36-40465*	January 31, 1937	January 29, 1938	
37-53539	January 26, 1938	January 27, 1938	
37-53548	January 28, 1938	January 18, 1940	
		January 17, 1940	
37-53550	January 28, 1938	February 2, 1942	Return—2
37-53589	February 4, 1938	February 22, 1939	
38-68204	March 2, 1938	January 17, 1940	
38-68222	March 7, 1938	February 22, 1939	
38-84365	March 1, 1939	March 2, 1939	
38-84383	March 15, 1939	January 17, 1940	
40-79881	February 14, 1941	January 4, 1942	
40-79883	February 25, 1941	February 20, 1942	
40-79884	February 25, 1941	February 3, 1942	
40-79888	March 1, 1941	January 3, 1942	
40-79892	March 3, 1941	January 15, 1942	
		February 10, 1942	

No. B160591 was found dead on its last return date; it was on the snow about 20 rods east of my trapping station, and also be-

tween 50 and 60 feet south of a telephone line which it may have hit. It was in good condition and fat. I saved the skin and found it to be a male.

No. L67404 (which returned January 18, 1936), was found dead on February 24, 1936, at 21½ feet from one of my feeding stations; and it may have hit a telephone wire which it was nearly beneath. It was preserved as a skeleton, and is a female.

Two recoveries have been reported since my last paper on this species (*Bird-Banding*, Oct. 1933).

No. H81229 banded March 10, 1933, was next heard from as "Probably found dead, at Moonbeam, Ont., Canada, about April 28, 1936, by Ernest Leonard."

No. 36-19361 banded February 22, 1936, was next heard from as "Found dead November 3, 1937, at Fort Coulange, Quebec, by Major C. E. Caron."

Three Snow Buntings that I banded have been trapped and released at the Seney Waterfowl Refuge, Germfask, Michigan. These are:

No. 37-53545 banded January 27, 1938; repeated January 29. Taken at Seney Refuge, February 2nd and 9th, 1939, by Homer L. Bradley.

No. 38-68204 banded March 2, 1938; repeated March 4th; returned February 22, 1939. It was next taken March 29, 1939 at Seney Refuge, by John H. Steenis. This bird was trapped at two stations about fifteen miles apart, and so we get some light on the winter feeding range of this species.

No. 38-68206 banded March 2, 1938; repeated March 3rd and 5th. It was next heard from February 6, 1939 when it was trapped by John H. Steenis at Seney Refuge.

The only other Snow Bunting which I have banded which has been trapped at some other station is No. 37-53589, banded February 4, 1938; it returned January 17, 1940; repeated January 19th. It was next taken February 15, 1941 at T-Lake in Blaney Park, Michigan, by Dr. Karl Christofferson.

The two "foreign" returns of the Snow Bunting that I have are of interest. Both were banded at the Seney Waterfowl Refuge on February 2, 1942 by John L. Sypulski, Jr., Refuge Manager. No. 139-24659 was trapped at my station on February 5, 1942 at 7:21 A.M., and was retaken February 8th, 10th, 16th, 17th, 19th, 24th, 26th, 27th, 28th; March 11th and 21st. The other bird—No. 139-24675, is my first "foreign" return of this species, and I trapped it at my station on February 3, 1942 at 12:05 P.M.; this being the next day after banding, and gives added interest on the winter feeding range. I got this bird on one other day—February

4th. With this bird came a real treat for these two banding stations as it was banded at one station one day, and then trapped at another on the next day.

Readers may note in the above list of returns, that No. L73527 has added another winter to its history; and it is now in its 9th winter, at least, and I feel sure of it being in its 10th winter, judging from my studies of the plumage of this species. It was last trapped on February 25, 1942.

In addition to the returns and recoveries, etc., in this paper, I give below, a summary of the number banded during the winters included in this paper.

Winter of 1933–34	113	Winter of 1938–39	21
Winter of 1934–35	38	Winter of 1939–40	36
Winter of 1935–36	150	Winter of 1940–41	27
Winter of 1936–37	6	Winter of 1941–42	107
Winter of 1937–38	98	Total banded	596

On February 24, 1942 I banded my 1000th Snow Bunting, and my grand total number banded of this species is now at 1024. It may be noted in the above list of Snow Buntings banded in the last past nine winters, that there are three winters that the number banded is over 100; and that there is one winter with an unusually small number banded. To explain the reason for these extremes of winter catches of this species, it is my hope that readers will not be misled to the belief that the more severe the winter, the more these birds would be forced to come to feeding stations, and also, that the more open the winter with frequent thaws, the less these birds would be forced to come to stations. I have now banded some of this species in fourteen different winters (beginning with that of 1928–29), and have put in almost the same amount of time in trapping each winter. And through this period of time I do not find the above mentioned beliefs to hold true. My biggest winter is that of 1932–33, when 174 were banded, and that was the most open of these fourteen winters. In the above list of bandings for the last nine winters may be noted that only six were banded in winter of 1936–37; that is what might be termed as a moderate winter with some bad storms. In this winter, three were banded in January and three in February. Many ornithologists may yet remember the winter of 1939–40 when snow fell in some localities in southern United States where it was not known to have occurred before; also colder weather than had been known before was recorded from many southern localities. In that winter, I banded 36 Snow Buntings and also got four returns, which makes 40 for that winter, and all were trapped in the month of January. Not a single capture was made during the remainder of that season, and

the Snow Bunting was a scarce species until spring thaws brought bare ground in view, and then they did not appear in usual numbers. That was not an open winter here in Luce County, Michigan, by any means.

Thus, through my several winters trapping of the Snow Bunting, I feel safe in saying that a larger number will remain through the winter if it is an open one than there will if it is severe. In the open winters (when there are no great snowfalls so that Nature's storehouses of weed seeds in the fields remain uncovered) conditions are such that larger numbers will remain. In this case, the number of birds wintering may exceed the supply of weeds in fields they frequent for the season. Then they come to farm yards and feeding stations if they remain in that vicinity. In the winters when the snow cuts the weed seed supply short by covering the weeds these birds are forced to come to farm yards and feeding stations. It may now be noted through my observations that the winter food supply will become scarce in either type of winter, and this may appear to many that there is no difference in reason for them remaining in larger numbers in one winter than in another. But here is a great factor in this case: the more open the winter, the less the feed in farm yards and at feeding stations becomes covered with snow; and the greater the snowfall, the more difficult it is to keep feed from being covered with snow. If feed were not available at these last resorts, they must then move to other regions.

R.F.D. No. 1, McMillan, Luce County, Michigan.

GENERAL NOTES

Unorthodox Banding Procedures.—Whereas the activities described below are not recommended as proper banding procedure, they were thought sufficiently interesting to warrant recording.

On the night of April 10, 1943, a group of us visited a barn over four miles from my home (Glen Mills, Penna.). We found a pair of Barn Owls (*Tyto alba pratincola* Bp.), with the female incubating a single egg. Strategically locating ourselves, we eventually caught both birds. Having no bands with me, I decided to take them both back to the house. They were accordingly gently wrapped in burlap bags for the trip. At home, their legs were measured, they were weighed (♀ 20.5 oz., ♂ 16.5 oz.), and banded (♀ 41-721326, ♂41-721327). Again wrapped in the bags, they were returned to the barn and released, apparently none the worse for their experience.

My next trip to the barn was on June 6, at which time there were 2 little owls and three eggs, one of which was pipped. On June 26, the young ones were banded. Three live chicks were in the nest (40-673406 to 08), a dead one lay on the straw beneath, and no trace of the potential fifth could be found. So, the adults had not only survived their midnight experiences, but had successfully gone on to raise a family.

A similar experience was had with an American Kestrel (*Falco s. sparverius* Linn.). Five miles from my home I discovered an adult female incubating 5 eggs (April 25, 1943). Again having no bands with me, I decided to risk transportation, so wrapped her in my handkerchief and headed home. There she was banded (41-331509), again rolled in the handkerchief, and carried back to the nesting stub. As I climbed to replace her on the eggs, the male came in with a mouse in his talons, and was only a few feet away when he saw me. He swerved and flew off, still bearing the mouse. I very gently replaced the female and cautiously climbed down, retiring to a safe distance where I could watch what happened.

The female remained in the nest-cavity, and soon her mate was back with the mouse. His soft chittering brought her out immediately, she took the food from him and flew to a nearby tree. There she scolded for some minutes before eating, but eventually consumed the whole mouse. Then she very thoroughly went over her whole body, rearranging each feather that had been displaced during her trip. Finally she reentered the nest hole, and I departed.

I checked these little falcons as they were hatching, and when I thought of them again, they had grown up and flown, leaving ample evidence of a successful upbringing. One egg failed to hatch. Again, what to the parent must have been a rather frightening experience was forgotten in the more pressing duties of parenthood.—Robert M. Stabler, Department of Zoölogy, University of Pennsylvania.

Size 1B Bands Found Preferable.—The relatively new 1B bands were developed, I understand, to be used on Chimney Swifts (*Chaetura pelagica* (Linn)). I have had occasion to use these bands on only two species of birds to date, but, in both instances, they have proved to be much more satisfactory than the too large 1A size. The Eastern Song Sparrow (*Melospiza m. melodia* Wils.) and the White-throated Sparrow (*Zonotrichia albicollis* (Gmel.)) are the two species for which I have found the 1B bands to be preferable.—G. Hapgood Parks, 99 Warrenton Ave., Hartford, Connecticut.

Unusual Behavior of Hairy Woodpecker.—The following behavior by a female Eastern Hairy Woodpecker (*Dryobates v. villosus* (Linn.)) was noted last spring after I had discovered the nest, on June 30, in the hollow trunk of a small apple tree in Millbridge, Maine.

The nest-opening was about shoulder high. From it came noises which indicated that the nestlings were well developed. Shortly after the discovery had been made the male parent entered the nest. He was captured, as he left, by means of a light landing net. He was banded and released. When the female entered the nest, several minutes later, I again covered the opening with the net, following the same procedure which had just taken her mate, as well as a whole family of Flickers (*Colaptes auratus luteus* Bangs) earlier that same morning. But she was not so readily captured. Instead of flying out into the net as the other birds had done, she merely perched in the nest-hole. Stretching to her limit she inspected the twine which constituted the mesh, frequently taking it in her bill and moving it as if to brush it aside. She also explored the wire frame of the net and attempted to force her bill and head between it and the trunk of the tree. After more than an hour of this behavior my available time gave out, so I approached the tree and tried to hasten her exit by tapping and slapping on the tree trunk. She only retreated into the nest. Finally she won out. I departed and took my net with me.

Next day, from hiding, I saw her again enter the nest. The net was placed over the entrance and I returned to my hiding-place to watch. The bird's bill, and then her head, pushed cautiously out of the hole and into the space enclosed by the mesh of the net. Then, just as slowly, she disappeared again inside the tree

trunk. The sound of hammering reached my ears. Spells of hammering were interrupted frequently, but only long enough for the bird's head to appear through the nest-hole as she inspected the net. For almost two hours the bird kept up this behavior while I watched. Then I went to the tree as quietly as possible from such a direction as to be completely hidden from the opening. There I waited until there was a pause in the hammering and the scratching sounds told me that she had climbed to her perch of inspection at the hole. I struck the trunk a resounding blow with a piece of barrel stave. There was a brief scratching inside, and the hammering began again.

A tactual survey of the tree trunk with my finger tips revealed that the bird was drilling a hole on the opposite side of the tree from the original nest-opening, a back door, so to speak. How could such a woodpecker be captured? As I went away the drum-beat of her carpentry continued as long as I was within ear-shot.

Next day I passed by that tree again. The nest was deserted. The back door had not been completed.—G. Hapgood Parks, 99 Warrenton Ave., Hartford, Connecticut.

Report on a sick Northern White-breasted Nuthatch (*Sitta carolinensis carolinensis* Lath.) Adult ♀ No. 138-14509, banded December 11, 1938 at Laceyville, Pennsylvania. Trapped in a Potter single cell trap on a window feeding shelf. Was retaken in the following manner—on January 20, 1939, I noticed a feathery ball clinging to the trunk of a large maple tree, about four feet above the ground, and on examining more closely realized it was a nuthatch. I easily picked the little bird off the tree trunk, and noticed the band which, upon checking my records, revealed the banding data given above. The nuthatch was put in a gathering cage, and kept warm in the kitchen. The little visitor shivered with chills, and showed considerable weakness. It tried to eat some peanuts, but became weaker and died in the evening.

The nuthatch was immediately sent to Dr. C. Brooke Worth, who was then at Swarthmore College, Swarthmore, Pa. I received a letter from Dr. Worth dated January 28, 1939, which contained interesting data, and quote here parts from his letter: "Allow me to express my gratitude to you for submitting the nuthatch. Due to the pressure of the new semester I was unable to work on it until 24 hours after receiving it, so that decomposition had advanced rather farther than desirable. However, I was able to observe the following pathologic changes: 'Plumage, skeleton, and muscular development normal. Subcutaneous fat deficient. One lung markedly congested. Stomach contained gravel but no food. Intestines showed profound hemorrhages throughout. Microscopical examination of intestinal blood disclosed many small cysts. Liver grossly normal. Pancreas, spleen, and gonads liquefied (decomposed). Kidney normal.'

On the basis of the observations I believe that the bird had a hemorrhagic enteritis caused by some sort of amoeba, and that the immediate cause of death was a terminal pneumonitis consequent upon malnutrition and lowered resistance."—Charles C. Vandervort, Laceyville, Pennsylvania.

A Migratory White-Breasted Nuthatch.—The White-breasted Nuthatch (*Sitta carolinensis carolinensis* Lath.) is generally considered a permanent resident, although it is said to make some migration during the winter from its extreme northerly range to a more southerly region.

E. H. Forbush writes, in his "Birds of Massachusetts and Other New England States," "They often appear in winter where they never breed," while Thomas S. Roberts states, in his "Birds of Minnesota," 1936, under General Range, "The White-breasted Nuthatch is resident where found." F. C. Lincoln, in his book on migration, 1939, makes the statement that in the coastal plane between Washington, D. C., and the ocean, the White-breasted Nuthatch is usually absent during the summer, retiring to the higher Piedmont country to breed, and late in the fall it appears in the wooded lowlands, where it remains until the following

March and April. Lincoln gives a record of a banded White-breasted Nuthatch showing a northward migration. This bird was banded at Middleboro, Massachusetts, on February 22, 1926, and two months later, April 23, 1926, it was caught by a cat at St. George, New Brunswick.

During the past six years I have banded 35 White-breasted Nuthatches at my Ardmore, Pa., station. From this number I have had seven returns, six of which I would consider permanent residents on the basis of their repeats in my traps. The seventh one may possibly be a migratory bird. This bird was banded at Ardmore June 27, 1940, and repeated once on September 19, 1940, and did not return again until October 20, 1941, and was not retaken after that date until November 29, 1942. Since there was a lapse of over a year between each return, it may indicate a possible migration.

Recently I received a recovery report from the Fish & Wildlife Service, Washington, showing an actual migration of one of my White-breasted Nuthatches. This bird, an adult female, No. 39-169253, was banded at the Ardmore, Pa., station on December 31, 1939, and about three years later, on February 14, 1943, it was found frozen to death at Barrytown, Dutchess County, New York, a distance of about 200 air miles north of the Ardmore, Pa., station, the place of banding. Due to the fact that banding records of White-breasted Nuthatches showing actual migration appear to be rare, I thought it may be of interest so report this recovery.—Horace Groskin, 210 Glenn Road, Ardmore, Pennsylvania.

The Second Nesting of the Red-Wing on Cape Cod.—In the *Birds of Massachusetts and Other New England States*, volume 2, page 430 (1927), Forbush states that he has "seen no conclusive evidence" that the Red-wing (*Agelaius p. phoeniceus* (Linn.)) raises two broods yearly in New England. The following observations show that some Red-wings do nest twice in one season on Cape Cod.

On May 2, 1936, while at the Austin Ornithological Research Station, North Eastham, Massachusetts, I heard a female Red-wing give an extraordinary call, quite unlike any Red-wing note I had ever heard. During the next few days I saw the bird frequently, identifying her easily by her call, and noted that she was wearing a band. On the 18th, she flew off a nest in some bushes over the pond. There was a house trap near her nest where Red-wings often were caught, and on May 21, as I approached the trap I saw this female inside and heard her sound her characteristic call. Her number was A277036, banded May 2, 1931, and caught yearly thereafter. She had been caught in the trap before, but could not be identified certainly with the bird I was watching until she called in the trap. A male, A277830, banded June 13, 1932, also frequented the trap, and was probably her mate. On June 10 two young were banded in her nest, 34-258924 and 34-258925. At that time sixteen pairs of Red-wings were breeding on the pond.

Forbush gives June 18 as the late nesting date for Red-wings in Massachusetts. On June 27, 1936, I made a second census of the Red-wing nests on the pond. All the young had flown from the nests in use on June 10, and six new nests with eggs were discovered. From one new nest, located about twenty feet from her first, A277036 flew up, calling characteristically in her alarm. There were no eggs in it then, but on July 8 she was again observed on this second nest, with four unhatched eggs. Observations terminated before the second brood could be banded.—Fred M. Packard, Ensign, U.S.N.R.

Heavy Flight of Purple Finches.—It has surprised me neither to hear nor to read any mention of last spring's (1943) flight of Eastern Purple Finches ((*Carpodacus p. purpureus* Gmel.)). My own station was visited, during February

March and early April, by this species in numbers second only to the historic flight of 1939. Two hundred seventy-three new birds were trapped and banded, but not a single return was taken.—G. Hapgood Parks, 99 Warrenton Ave., Hartford, Connecticut.

RECENT LITERATURE

Reviews by Donald S. Farner

BANDING STUDIES

1. The Age of the Blackbird. David Lack. 1943. *British Birds*, 36: 166–175. In the four years, 1931–1934, a total of 10,539 nesting Blackbirds *Turdus merula merula* (Linn.) were banded; 192 (1.8%) were recovered dead. Of the Blackbirds trapped and banded during the same period 3.5% were recovered. The age determinations in this study are based on 592 birds banded as nestlings. It was found that 55% of the first-year birds die during the year whereas 38% of the second-year birds die during the year. In the third-, fourth-, and fifth-year age groups the death rate is about 40% per year. Hence assuming the population to be stable, for each 100 juveniles alive on August 1 there should be 46 second-year birds, 28 third-year birds, 14 fourth-year birds, etc. For every 100 juveniles alive on August 1 there are about 107 adults. This has been verified by field observations. On August 1 the life expectancy of the first-year birds is 1.6 years; for all other age-groups, 1.7–1.9 years. "Assuming that there are six males to every five females, 100 adult Blackbirds correspond to 45 breeding pairs. Therefore if the Blackbird population is stable, every 45 breeding pairs must produce 133 fledglings per year or just less than three fledglings per pair per year." This is reasonable in view of the fact that the Blackbird normally lays four or five eggs per nest and has two or three broods per season. The "potential age" (captivity records) of the Blackbird is stated to be about twenty years. Two ten-year birds were recorded in this study. It is therefore to be concluded that the Blackbird's expectancy is only 8% of its potential life span. An interesting paper.

MIGRATION

2. The Migration of the Sandwich Tern. A. Lansborough Thomson. 1943. *British Birds*, 37: 62–69. The conclusions in this paper are based on 317 recoveries of banded Sandwich Terns, *Thalasseus sandvicensis sandvicensis* (Lath.). From 1909 to 1942 a total of 17,987 of this species was banded; 1.76% were recovered. There is a more or less random dispersion of some of the young as soon as they are able to fly. It is possible that there is a northward tendency in this dispersion. The southward migration follows the coasts of Europe and Africa to the Cape of Good Hope and then eastward and northward sometimes as far as Natal. There is also a movement into the western Mediterranean as far as Sicily. "Some of the first year birds remain in the North Temperate Zone in November, and many probably never cross the equator as there are records from the North Tropical Zone throughout the winter." It appears that the older birds reach Cape Province more frequently than do the young and that possibly only old birds reach Natal. "Some birds, of all ages, remain in the Tropics through-

out the breeding season instead of migrating northward; others return to their native area, perhaps frequently to the exact locality." Actually the author has but a single record of a change in colony. However, since there are only recoveries on the British Isles more data are needed to clarify these points. The small numbers of recoveries during the nesting season on the British Isles may indicate a very low mortality rate during the breeding season. The record age is that of a bird banded in June, 1917, and recovered in Southwest Africa in February, 1931.

3. Observations on Palearctic Waders and European Swallows in the Cape Peninsula. G. J. Broekhuysen and M. F. M. Meiklejohn. 1943. *The Ostrich*, Supplement No. 1, 38 pp. This paper is a significant compilation of information on the winter habits of some palearctic migrants. Observations were made at Zeekoe Vlei and Ronde Vlei, Cape Peninsula, Union of South Africa. The most common palearctic migrants at these stations were the Little Stint, *Calidris minuta* (Leisler) and the Curlew Sandpiper, *Calidris testacea* (Pallas). The Ruff, *Philomachus pugnax* (L.); Marsh Sandpiper, *Tringa stagnatilis* (Bechstein); and the Ringed Plover, *Charadrius hiaticula* L. were also common. There are abundant data on arrival dates, relative abundance at various times, and last dates observed.

ECOLOGY AND POPULATION STUDIES

4. Ruffed Grouse Management. Ralph T. King. 1943. *Roosevelt Wildlife Bulletin*, 8: 63–80. In this paper the author outlines fundamental concepts which must be observed in Ruffed Grouse (*Bonasa umbellus* (L.)) management. The information is drawn largely from his experience and investigations in north-central Minnesota. A basic consideration is the fact that Ruffed Grouse populations are fundamentally cyclic with large losses at approximately ten-year intervals. These losses may be as much as 90% of the population. Sound management requires that the periods of depletion be ascertained in advance so that closed seasons can be enforced in order to preserve the breeding stock. By censuses such declines can be detected as early as May, sufficiently early to resort to a closed season in fall. The maximum Ruffed Grouse breeding population density is one bird per four acres. Invariably larger fall densities reduce themselves to this figure during the winter. The exact reason for this limit is unknown although the author suggests that it may be accounted for by the "species intolerance of greater crowding" or the "exercise of individual territorial rights." On the basis of his experience the author regards 17% as the normal winter loss. "If the winter losses exceed 20% of the fall population the fault lies in the environment and must be sought for and corrected there. This fault is very likely to be in cover." From a management standpoint the allowable shootable population is the excess over the maximum breeding plus 20%.

In order to maintain the maximum breeding population it is necessary to have (1) A fall population 20% larger than the largest possible overwintering population. (2) A range containing all of the winter requirements for Ruffed Grouse. (3) "A degree of interspersion which will allow each unit of the range to produce and support its proportion of the total maximum population." The great single loss (aside from the periodic cyclic losses) is juvenile mortality which is normally at least 75%. In this category of juvenile mortality the author includes nest destruction (about 3% of all nests), loss of one or more eggs from clutch (about 30% of nests and amounting to 5% of all eggs observed), large chick losses during the first 30 days, loss of young due to predation (insignificant), and losses "due to a condition existing before they are hatched." The author feels that the last accounts for the greatest loss of young birds.

Concerning the nutrition of breeding birds the author makes the following statements: "At this time (breeding season) when food conditions are at their worst for the entire year, and immediately following the long rigorous period of winter, the birds are called upon to meet the greatest physical drain of the year, that is, mating and reproduction. Reasoning by analogy with domestic animals it seems logical to assume that such extreme conditions must of necessity result in reduced vitality of the subsequent broods. It is therefore highly probable that any improvement in food conditions during late winter and early spring will result in lessened juvenile mortality and a consequent increase in the survival rate." This is an interesting idea and should prove to be an interesting research problem. He suggests that clovers, strawberry, and fruit-bearing species which retain their fruits over winter and do not grow to a height that exposes the fruits above the snow during the winter are the best foods for this period. Artificial feeding has been unsatisfactory.

Cover is as important as food. The requirements for nesting cover, brooding cover, molting cover, and winter cover are discussed. Severe weather before there is sufficient snow or during periods when the snow is heavily crusted may result in considerable losses. Water requirements offer no problem except for a few weeks in late summer when there is no dew, frost, snow, or succulent vegetation.

The author emphatically denies the argument that heavy shooting during the upswing of the cycle would decrease the severity of the decline. He denies that there is any relation between overpopulation and cyclic declines. He further suggests the importance of saving a maximum number of the older age classes during the low point of the decline since "there is evidence to indicate that only those birds born four, five, and six years before the crash (decline in population) have sufficient stamina and reserve to carry them over the decline." "It is this group of older birds that makes up the group of survivors and furnishes the breeding stock responsible for the next cyclic recovery."

5. A Contribution to the Breeding Ecology of *Euplectes* (Bishop-birds) in Tanganyika Territory. N. R. Fuggles-Couchman. 1943. *The Ibis*, 85: 311–326. The author records his observations made in 1938 on the breeding habits of *Euplectes hordeacea* (L.) and *E. nigroventris* Cassin (Family Ploceidae). These observations were made at Morogoro, Tanganyika (1600 ft.) at the foot of the Uluguru Mountains. In 1938 both species had a breeding season of about three and one-half months although *nigroventris* began nesting three weeks earlier than *hordeacea*. This season both species nested in strong, almost shrubby, growths of Ramie in spite of the proximity of suitable areas of grass, the normal nesting habitat. The reason for this anomalous nesting was not apparent. Territories of *nigroventris* varied from 120–510 square yards although the largest was eventually reduced to 300 square yards. The *hordeacea* territories were usually of about 500 square yards. Boundaries were preserved rather vigorously by the males against the males of either species. However, there was one instance, at least, when a *hordeacea* male (the larger species) usurped portions of *nigroventris* territories. Also the author states that later in the season *hordeacea* males showed some tolerance for the males of *nigroventris*. *Coliuspasser abonopasser* Neunzig was tolerated in the territories of both species of *Euplectes*. Incubation period for *nigriventris* was found to be 19 days; for *hordeacea*, 13½ days.

6. A Comparative Study of the Breeding Bird Population of the Shenandoah Mountains, Virginia. Robert E. Stewart. 1943. *The Auk*, 60: 388–396. A census of breeding birds in an area of 135 acres in the Shenandoah Mountains in Virginia was made during the month of June. A total of 2160 individual birds was recorded. The breeding fauna is a mixture of Austral and Boreal with the former predominating. The three most abundant species were the Ovenbird

(*Seirus aurocapillus* (L.)), Red-eyed Vireo (*Vireo olivaceus* (L.)) and Towhee (*Pipilo erythrophthalmus* (L.)). *Seiurus, Dendroica,* and *Vireo* were the most abundant genera; 92% of the nesting species were passerines; 39% belonged to a single family, Compsothlypidae. The two most important game birds, the Ruffed Grouse (*Bonasa umbellus* L.) and the Wild Turkey (*Meleagris gallopavo silvestris* Vieillot), constituted about 1.5% of the total breeding population. "The ratio of diurnal birds of prey to the smaller non-predatory forms was about 1 : 259."

7. Apparatus for Marking Wild Animals with Colored Dyes. James Moffitt. 1942. *The Journal of Wildlife Management,* 6 : 312–318. The author describes an inexpensive apparatus designed for marking of birds or mammals when trapping is not desirable. The animals are sprayed with a dye solution by the use of compressed air. It is suggested that this paper be consulted by anyone who is confronted with the problem of marking birds by other means than banding.

REPRODUCTION

8. Notes on the Southern Robin (*Miro australis*). L. E. Richdale. 1942. Printed by the *Otago Daily Times,* New Zealand. 8 pp. This "Robin," one of the Muscicapidae, was once a common bird throughout New Zealand, "as far as its territorial mode of life would permit," but today it is rare. "Its disappearance is due largely to the destruction of its habitat before the advance of civilization, to the introduction of vermin, and, in particular, to the domestic cat." A few bred in the aviaries of Mr. W. D. King. In September, 1940, the female built her nest and incubated her two eggs which took 20 days to hatch, the male in the meantime feeding her. For the first 10 days after the hatching of the chicks the female fed them with food supplied her by her mate; after that he fed them directly. They left the nest at three weeks, but "were kept for eight days by the male" on a particular branch. (The male had driven his mate back to incubating duties and chased her if she tried to get food for herself.) At one month the young began to pick up food for themselves and at 46 days were independent.

Mr. Richdale writes me that in 1941 the incubation period for the two eggs of this same female was seventeen days. Most unfortunately, the Department of Internal Affairs refused to allow these scientific experiments to continue, compelling Mr. King to release all his native birds.—M. M. Nice.

9. Nest Life of the Eastern Yellow Warbler. F. G. Schrantz. 1943. *The Auk,* 60: 367–387. This paper is based on the observations of forty-one nests of the Eastern Yellow Warbler, *Dendroica aestiva aestiva* (Gmelin), at West Okoboji Lake, Iowa. The mean dimensions for seventy eggs measured were 17.32 × 13.29 mm. The average weight at the end of egg laying was 1.57 gm. as compared to 1.40 gm. just before hatching. As a rule the last-laid eggs were heavier than the first-laid. Not more than one egg was laid per day. All of the incubating was done by the female; both parents shared in the feeding of the young. The incubation period is about eleven days. "The young averaged, when hatched, 1.27 gms.; at one day old, 1.87 gm.; at two days old, 2.95 gm.; at three days old, 4.36 gm.; at four days old, 5.57 gm.; at five days old, 7.26 gm.; at six days old, 8.20 gm.; and at seven days old, 8.78 gm."

10. Notes on the Breeding of the Pine Siskin. Richard Lee Weaver and Franklin H. West. 1943. *The Auk,* 60: 492–503. The unusual influx of the Pine Siskin, *Spinus pinus pinus* (Wilson), into New England during the winter and spring of 1941 was followed by the nesting of a few pairs at Hanover, New Hampshire. The author has recorded the observations made on four nests. Nesting behavior was found to be strikingly similar to that of the American

Goldfinch, *Spinus tristis tristis* (L_4) in that the construction of the nest in both species requires five days and is done by the female only, although the male accompanies the female in the search of nesting material. In both species the incubation period is thirteen days and only the female incubates. The species are further similar in that in both the young are brooded only by the female; the male feeds the female by regurgitation; the young in turn are fed by the female until the latter part of the fledging period. The young of both species leave the nest fifteen days after hatching.

11. Some Notes on the Breeding of a Pair of Spotted Flycatchers. B. H. Ryves. 1943. *British Birds*, 37: 82–84. These are notes on a breeding pair of Spotted Flycatchers, *Muscicapa striata striata* (Pallas). On May 15, 1943, a male arrived, sang continuously all day, and frequently inspected a hollow in an old pine. The following day a female joined the male and both inspected the hole. On the 17th both inspected the hole again. Neither one was seen during the following two days. On the 20th the male reappeared and examined the hollow; on the 21st both birds were again present. Nothing further was seen of either birds until the 26th when excitement over the hollow became intense. Nesting began on the 30th and 31st when the female deposited some lichen in the bottom of the hollow. Inclement weather caused a discontinuance until the 6th when building was resumed; the nest was completed on the 9th. The four eggs were laid on successive days from the 12th to the 15th with occasional brooding during this period. The female alone incubated. At first incubation was for periods of 20–30 minutes, gradually lengthening to an hour as hatching approached; absences for feeding were 7–11 minutes or less in length. The eggs were hatched on June 29th, an incubation period of thirteen days.

12. Nesting of the Goosander on the Shore of Lake Geneva in 1941. (La nidification du Grand Harle sur les bords du Léman en 1941.) J. Burnier. 1942. *Nos Oiseaux*, 161: 137–144. During the summer of 1941 there were at least six nesting pairs of Goosanders, *Merganser merganser merganser* L., on Lake Geneva. This increased number is thought to be the result of the more tranquil conditions on the lake because the gasoline shortage has suspended the use of motor boats. One nest was found; it was in a hollow in a dead poplar tree about eight feet above the ground.

13. The Alta Mira Oriole and its Nest. George Miksch Sutton and Olin Sewall Pettingill, Jr. 1943. *The Condor*, 45: 125–132. The authors observed five nests of this species, *Icterus gularis tamaulipensis* Ridgway, during the spring of 1941 near Gomez Farias, Tamaulipas. The nests were in exposed positions attached to branches 30–80 ft. above the ground. One nest was in a completely dead tree while another was attached to a dead branch of a living tree. The orioles were in no way secretive in nest-building. The authors suggest that there may be some relationship between bright colors of the females of the species and the open exposure of the nests. The time involved in building the nest is not less than eighteen days and may be as long as twenty-six days.

14. An Examination of Incubation in its Wider Aspects Based on Observation in North Cornwall. B. H. Ryves. 1943. *British Birds*, 37: 42–49. The author lists several examples of retardation of egg-laying following nest building, unusual rapidity in egg-laying, and normal intervals between successive clutches. He cites several instances of brooding by females prior to incubation and some examples of delay between the time of completion of the clutch and the beginning of incubation.

15. A study of the Violet-Green Swallow. J. M. Edson. 1943. *The Auk*,

60: 396–403. This paper describes some of the observations made by the author on bird box nesting Violet Green Swallows, *Tachycineta thalassina lepida* Mearns. Of particular interest are the data on the weights of nestlings which demonstrate well the weight plateau which is reached at about 14–16 days with the subsequent decrease in weight beginning at about twenty days and continuing until departure from the nest at 23 or 24 days.

16 Factors in the Incubation Behavior of the Common Tern. Nelson Marshall. 1943. *The Auk*, 60: 574–588. Experiments involving the addition, removal, and replacement by egg-shaped stones of the eggs of the Common Tern, *Sterna hirundo hirundo* L., are described. If at least one egg is allowed to remain in the nest normal attendance by adults continues after reduction or addition to the number of eggs. Considerable variation was observed in egg-rolling. Some birds would roll eggs into their nest even though it already contained a normal complement. The tendency to roll eggs is greatest when the nest has been emptied. "The nest site, rather than the nest itself or the eggs, exerts the initial attraction to the broody Common Tern as it alights in the colony." The adults apparently do not recognize their own eggs; the general appearance of the surroundings apparently is the important factor in nest recognition.

17. Nesting Habits of the Common Redpoll. Lawrence I. Grinnell. 1943. *The Wilson Bulletin*, 55: 155–163. Nine nests of the Common Redpoll, *Acanthis linaria linaria* (L.), were studied during June and July, 1940 at Churchill, Manitoba where this species is abundant. Eggs were laid at intervals of one or two days, usually one day. Incubation period was 10–11 days and the nestling period, 11 to 12 days. Both incubation and brooding were performed by the female only. The nine nests contained 33 eggs; 72% hatched and 39% resulted in fledglings. "According to the stage of nestling development, average intervals between feedings were: 38 minutes (age one to four days); 23 minutes (age five to seven days); and 19 minutes (age eight to ten days)."

18. Canada Goose Nests and Eggs. Cecil S. Williams and Marcus C. Nelson. 1943. *The Auk*, 60: 341–345. The authors have obtained measurements from 100 nests and 174 eggs. The mean egg length was 87.7 mm. (standard deviation = 3.0 mm.) and the mean egg width was 59.1 mm. (standard deviation = 1.2 mm.).

19. Nest-site Selection by Birds. Caroline and Desmond Nethersole-Thompson. 1943. *British Birds*, 37: 70–74. This is the first part of a systematic recording of notes on nest-site selection by various species of British birds. Nine species are included in this section. Because of the condensed nature of the notes it is not possible to represent adequately here the information they contain. It is heartily recommended that readers interested in this subject consult these notes.

20. Nest-site Selection by Birds. Caroline and Desmond Nethersole-Thompson. 1943. *British Birds*, 37: 88–94. Notes on 81 additional species.

PHYSIOLOGY

21. Some Physiological Variations in the Black-capped Chickadee. Eugene P. Odum. 1943. *The Wilson Bulletin*, 55: 178–191. This paper not only contains some fundamental empirical data on heart and respiratory physiology of the Black-capped Chickadee, *Penthestes atricapillus* (L.), but also demonstrates some fundamental principles of avian physiology. Heart rate, breathing

rate, and muscle tremors were recorded with the cardio-vibrometer while the subjects were at basal conditions in a specially constructed temperature chamber. Sixteen determinations (January to June) at 90 ±1.5° F. gave heart rates of 346 (standard deviation, 18.2) to 547 (S. D., 25.4) beats per minute and breathing rates from 76.0 (S. D., 2.0) to 108.3 (S. D., 6.9) movements per minute; at 43 ± 2° F. (12 determinations, February to April) heart rate varied from 538 (S. D., 28.3) to 655 (S. D., 41.0) and breathing rates, 56.5 (S. D., 2.0) to 73.3 (S. D., 6.8); at 70 ± 2° F. (six determinations, March to June) heart rates varied from 539 (S. D., 31.2) to 555 (S. D., 23.7) and breathing rates, 50.6 (S. D., 5.8) to 76.4 (S. D., 3.6). Heart rate is subjected to two types of inherent, more or less rhythmic variation. One is correlated with breathing; the rate decreases slightly towards the peak of the inflation portion of the cycle and increases between cycles. This is opposite to the situation in mammals. The other variation is less definite and is probably due to a number of causes. "Heart rate probably may be considered a rough index to heat production and breathing rate a rough indicator of heat loss." Breathing rate increased between 70 and 90° F. Heart rate varies inversely with temperature between 43 and 90° F. The increased breathing rate is probably reflexive, being a part of the temperature regulating mechanism. Heart rate was found to be consistently higher in summer than in winter whereas the breathing rate at 90° F. was lower in winter than in summer indicating a seasonal variation in basic physiological rates. The Chickadee nestling, like other passerine nestlings, changes from a cold-blooded to a warm-blooded organism during its nest life. At about 7–9 days the temperature regulating mechanism becomes sufficiently established so that body temperatures with environments at 70° F. and 90° F. became about the same and heart and breathing rates reverse their relation to temperature. The highest heart and breathing rates were recorded at nine days. This is a significant paper.

22. Sex and Age Determination of Waterfowl by Cloacal Examination. H. Albert Hochbaum. 1942. *Transactions of the Seventh North American Wildlife Conference*, 1942. The penis is a constant criterion of sex in all ducks, geese, and swans. It is also an age criterion. Two stages are recognized: the small unsheathed penis of immature birds and the large adult penis which is enclosed in a conspicuous sheath. It was found that the adult penis developed before the birds were a year old in the Mallard, Gadwall, Baldpate, Green-winged Teal, Blue-winged Teal, Shoveller, Pintail, Redhead, Canvas-back, and Lesser Scaup. The oviduct and bursa of Fabricius also assume adult condition by this time. The occluded left oviduct is a criterion of immaturity in females. The bursa is present only in immature birds of both sexes. Through summer, autumn, and early winter the penis, oviduct, and bursa are reliable criteria in distinguishing adult ducks from birds of the year. However Canada geese with immature cloacal characters may be birds of the year or yearlings. The author describes methods for examination of penis, cloaca, and bursa in both living and dead birds. This work contributes an excellent tool for ecology, life history study, as well as practical management.

23. A Gross Study of the Bursa of Fabricius and Cock Spurs as Age Indicators in the Ring-necked Pheasant. J. P. Linduska. 1943. *The Auk*, 60: 426–437. The author has studied criteria for age determination on about 2000 individual Ring-necked Pheasants, *Phasianus colchicus torquatus* (Gmelin). The condition of the bursa of Fabricius was found to be a reliable indicator for distinguishing young from adults. A simple method for ascertaining the condition of the bursa in live or dead birds is described. In fall (until September) the bursa was found to persist in all juvenile birds (birds of the year). Its presence and depth can be determined by probing through its opening into

the cloaca. At this time of the year the bursa is absent in all adult birds although the opening into the cloaca may persist in a few. In these the depth is 3 mm. or less whereas the young at this time of the year usually have a bursa depth of 16 mm., never less than 10 mm. "Monthly examinations of captive birds indicated that the bursa opening was still present in all juveniles in February. However the length of the duct had been reduced to less than 5 mm. in a few cocks by January and a few hens by February." Hence after January age determinations on this basis alone would be unreliable. The use of spur length, shape, texture, and color as criteria for age determination is also discussed and statistics are given. The use of spur length should be accompanied with some caution. "It is our experience in Michigan that, as late as January, age recognition is possible for fully three-fourths of the cock birds by noting spur characters alone. The presumed ages of doubtful specimens may be easily verified by reference to the bursa, which can be probed through its opening into the cloaca. Aging of all hens was found possible into January, the juveniles being characterized by a bursa depth greater than 5 mm." It would have been interesting had the author amplified and supported his statement concerning the endocrine function of the bursa of Fabricius. This is an important piece of research.

24. The Molts of Young Wild and Domestic Turkeys. A. Starker Leopold. 1943. *The Condor*, 45: 133–145. This is the first single complete account of molting in turkeys. The young pass through three molts before acquiring the winter plumage. (1) The *postnatal molt* actually begins before hatching with the beginning of development of the juvenile remiges since the first project from their sheaths at the time of hatching. The postnatal molt of the head is not completed until the 10th or 11th week by which time the postjuvenal is more than half completed on the body and wings. The postnatal molt is a complete molt. (2) Actually the *postjuvenal* molt begins in the 4th week with the replacement of the central pair of rectrices. The first primary drops at the beginning of the 6th week and the body plumage molts in the 7th week. The postjuvenal molt of the head is delayed until about the 14th week. The postjuvenal molt, except for the retention of one or two distal primaries in each wing, is complete. (3) The first winter molt is incomplete and begins at about the 15th week. Eventually the body plumage, lesser and middle wing coverts, parts of the tail, and sometimes the upper secondary coverts are replaced. As a result there is a mixed winter plumage consisting of juvenal, postjuvenal, and winter elements. Adult turkeys undergo two molts per year, a complete molt in summer and a partial prenuptial molt late in winter. The molts in young domestic turkeys is similar to that in *Meleagris gallopavo silvestris* Vieillot although more extensive in at least three feather tracts. Hybrids are intermediate.

25. The Wing Molts of Adult Loons: A Review of the Evidence. George Miksch Sutton. 1943. *The Wilson Bulletin*, 55: 145–150. On the basis of some observations at Southampton Island, Hudson Bay, in 1929 and on a survey of some English and American literature the author points out that our knowledge on the molts of loons is incomplete. It is not apparent whether the remiges are molted once or twice a year. Information is also lacking on the occurrence of the flightless period.

FLIGHT

26. Notes on the Chimney Swift. C. Brooke Worth. 1943. *The Auk*, 60: 559–564. This paper records the unusual adaptation of flight by Chimney Swifts, *Chaetura pelagica* (L.), which were roosting in chimneys which were closed at the top so that entry could be made only through "windows" in the four sides

of the chimney. The peculiar adaptation of flight is best described in the words of the author. "The swifts flew several hundred yards from the building and then turning, dashed rapidly toward it at a height only a few feet from the ground. At a suitable distance away, they almost ceased beating their wings but turned them upward so as to glide forward and upward in an arc whose convexity was toward the wall of the building. Of course their speed diminished rapidly both forward and upward but they gauged their progress so that at the peak of the rise (when, of course, all upward motion was lost) there was still a remnant of forward movement. At this point they turned sideways and oscillated in the customary manner, so that by 'lateral translation' they were carried almost horizontally into the chimney window. This maneuver was apparently more difficult to accomplish than that required for the open-top approach, and on windy evenings it was attended by many failures. Three or four attempts were sometimes made before some of the birds succeeded in arriving properly at the windows."

27. Flight-speeds of Hawks and Crows. Maurice Broun and Ben V. Goodwin. 1943. *The Auk*, 60: 487–492. Experiments were conducted on the flight-speeds of hawks and crows at Hawk Mountain Sanctuary, Pennsylvania, using telephonic communication over a measured course. Numerically significant results were obtained for five species: Sharp-shinned Hawk (*Accipiter velox* Wilson), 37 records, range of speed 16–60 miles per hour, average speed 30.0 m.p.h., median speed, 26 m.p.h.; Cooper's Hawk (*Accipiter cooperi* Bonaparte), 12 records, range of speed 21–55 m.p.h., average speed 29.3 m.p.h., median speed 26 m.p.h.; Eastern Red-tailed Hawk (*Buteo borealis borealis* Gmelin), 54 records, range of speed 20–40 m.p.h., average speed 29.0 m.p.h., median speed 28 m.p.h.; Osprey (*Pandion haliaetus carolinensis* Gmelin), 16 records, range of speed 20–80 m.p.h., average speed 41.5 m.p.h., median speed 38 m.p.h.; Eastern Crow (*Corvus brachyrhynchos brachyrhynchos* Brehm), 15 records, range of speed 17–35, average speed 26.0 m.p.h., median speed 27 m.p.h. The bibliography does not contain the excellent monograph of Stolpe and Zimmer (*Vogelflug*, 1939, Leipzig) which has compiled much information on bird flight.

BEHAVIOR

28. The Song of the Wood Pewee Myochanes virens Linnaeus: a Study of Bird Music. Wallace Craig. 1943. *N. Y. State Mus. Bull.* No. 334: 1–186. Dr. Craig, ornithologist, psychologist and musician, has done pioneer work on bird behavior, much of it with special emphasis on vocalization. In the present impressive undertaking he has studied the beautiful twilight song of the Wood Pewee with particular attention to psychological and esthetic implications. With the help of twenty observers from Maine to Oklahoma, 144 examples of the morning twilight song were collected, containing more than 93,000 phrases; these records were "analyzed statistically to determine the order of succession of the phrases and thus the musical structure of the song." During the daytime the Wood Pewee sings in leisurely style two "gliding" phrases (Phrases 1 and 2), but his twilight song contains about 50 per cent of a "rhythmic" phrase (Phrase 3); the most common "sentence" is 3132.

Figures 16–18 give the times of the first waking phrase, and of the beginning and ending of the morning twilight song, from June through August, plotted against the seasonal curves of nautical and civil twilight and sunrise. (Nautical twilight means "the exact minute when the sun is 12° below the horizon," civil twilight when it is 6° below.) The average time of the first waking phrase came when the sun was about 9° 36′ below the horizon; the twilight song usually starts

well before civil twilight in June and July, but around civil twilight in August. Throughout the season "the song ends, on the average, when the sun is about 3° below the horizon," p. 109. If cloudy and clear weather had been noted by the observers, the results might have been more clear cut. The twilight song does not begin for some time after the bird's arrival in spring, but no one has yet ascertained its relation to the nesting cycle.

As to the psychology of the song, we are told that while the bird "is singing one phrase, he anticipates the next one," p. 176. The author concludes that the "wood pewee's memory span may in some cases extend over three phrases," p. 139. In the matter of esthetics, "the concept of music is used in a broad sense." The student is advised to familiarize himself with the "music of poetry. Such a study will help him to see how even the songs of the worst singers, such as the chebec and some of the other flycatchers, are in a broad sense musical," p. 161. "Our entire study leads to the conclusion that bird songs are true music, they are esthetic art," p. 169.

The book is furnished with an index and a bibliography of five pages which includes many titles on esthetics. The twilight songs of the Tyrannidae offer a fascinating subject. Let us hope that this careful study on the finest musician of them all will inspire observers to similar work on other species.—M. M. Nice.

29. Notes on the Behavior of Certain Captive Young Fringillids. George Miksch Sutton. 1943. No. 474, *Occasional Papers of the Museum of Zoology*, University of Michigan Press. Observations on twelve individuals of four species. Vesper Sparrows (*Pooecetes gramineus*) backed, reaching heads forward in begging; they preferred living on the ground, but Cardinals (*Richmondena cardinalis*) and Indigo Buntings (*Passerina cyanea*) chose high places for feeding, roosting, and resting. The Vesper Sparrows were never found with heads tucked in feathers at night. Indigo Buntings were the last to settle at night. The Indigo Buntings became dominant, being the most pugnacious of the four species. Dust baths were taken by Vesper and Field Sparrows (*Spizella pusilla*). Regrettably, ages are not given when most of the birds began to bathe, drink, peck food, sing or twitter. A delightful whisper song by the oldest Vesper Sparrow was given when apparently about fifteen days old but it is not described. We know that many species, including Cardinal, Towhee, Field and Song Sparrows sing baby songs, different from adult singing, and one wishes Dr. Sutton had added data from his birds.

Alarm over some "suspicion-arousing object" was expressed by every bird by becoming slim, crouching, opening eyes wide, and becoming motionless. "The first sign of return to normal activity was the change in the shape of the eye." Puzzling "panics" occurred when, for no obvious reason, all the birds became very wild, heedlessly flying into objects. Neither persons nor a stationary broom provoked this behavior but sweeping with the broom caused frantic excitement. Excerpts from a communication of Dr. Konrad Lorenz are given, discussing "fright spasms." He says hand-raised birds of most species have no "inlet" for reactions of fleeing—that is, they are deprived of the parental warnings and signals of danger as well as the example of when to fly and from what to fly. These birds are not afraid of anything in particular, therefore they "get off" these pent up fleeing reactions at some quite irrelevant object (the sweeping broom in this case, a vacuum cleaner in the case of one of my Mockingbirds) or for no apparent reason. Lorenz says birds with innate stimuli for fleeing reactions (as the Magpie) never show these *ex vacuo* panics, except perhaps when confined alone.

A carefully handled group of birds raised in captivity in as nearly normal conditions as possible, like Dr. Sutton's group, affords almost unlimited opportunity for study of development and observations that could not be obtained in the wild, supplementing those in the field. Mrs. M. M. Nice's "Behavior of the

Song Sparrow and Other Passerines" (1943) is an outstanding example.—A. R. LASKEY.

SYSTEMATIC ORNITHOLOGY

30. A Revision of the Subfamily Estrildinae of the Family Ploceidae. J. Delacour. 1943. *Zoologica*, 38, Part 2: 69–86. The most important characters, apart from "primordial anatomical particularities," are the characteristic mouth markings in nestlings, specialized, diversified color pattern of plumage with no eclipse phase, and life habits. Young birds are able to breed within a year of their birth, "while it takes two years for young Viduinae and Ploceinae to mature," p. 72. "The nearest relations of the Estrildinae would seem to be the Viduinae, their specific parasites," p. 73. Interesting life history notes are given on these different Weaver-finches—Waxbills (Estrildae), Grassfinches (Erythrurae), Mannikins (Amadinae) and others.—M. M. NICE.

31 List of Hummingbirds in the Collection of the Carnegie Museum. W. E. Clyde Todd. 1943. *Annals of the Carnegie Museum*, 29: 271–370. This carefully prepared and annotated list will be invaluable to students of the distribution of the Trochilidae. The Carnegie collection is most abundant in specimens from Colombia, Venezuela, Bolivia, French Guiana, Amazon Valley, Rio Tapajóz, Rio Purús, Costa Rica, British Honduras, Puerto Rico, Isle of Pines, and the Bahama Islands. The list contains notes on 5,004 specimens belonging to 324 species and subspecies.

32. Bird Weights as an Aid in Taxonomy. Dean Amadon. 1943. *The Wilson Bulletin*, 55: 164–177. The author shows that when adequate weight measurements have been made for a species the variability is less than is ordinarily supposed. Because weight is directly proportional to volume which in turn is a function of the cube of linear measurements it is logical that the cube root of weight measurements be used in comparing weight variability with the variability of linear measurements. It is suggested that weight be used as a measurement for general size as well as for a standard of comparison for measurements of appendages.

33. An Aspect of Collector's Technique. T. T. McCabe. 1943. *The Auk*, 60: 550–557. Suggestions concerning incidental observations to be made in preparing bird skins, especially in relation to the reproductive systems.

HEREDITY, VARIATION, AND EVOLUTION

34. Corollary and Commentary for "Climate and Evolution." Karl P. Schmidt. 1943. *The American Midland Naturalist*, 30: 241–253. This paper is an able and interesting discussion of the relation of climate to evolution. Although the author draws most of the examples from the distribution of various reptiles and amphibians the principles illustrated may well apply to birds. The author in reviewing the pertinent literature shows how the evidence indicates overwhelmingly that the major evolutionary changes have occurred in Holarctica and are correlated with "pulsations of climatic change" and with large scale radiating dispersal of animals. In this radiating dispersal the primative forms are crowded to the periphery whereas the newly evolved successful forms remain in the center until displaced by the evolution of still more successful forms. However, the picture is complicated admittedly by secondary centers of evolution among the peripheral relict forms with accompanying secondary radiating dispersals. This excellent critical discussion is recommended to all ornithologists interested

in evolution and zoogeography.

35. Geographic Variation of the Genus Columba. Russell W. Cumley. 1943. *The Auk*, 60: 408–425. On the bases of wing, total length, culmen, and tarsus measurements of the species of *Columba* of the world the author considers the possibility of the extension of Bergmann's and Allen's Rules to the genus as a whole rather than to the individual species. He believes that Bergmann's Rule "or more likely a modification thereof" is applicable to the members of the Genus *Columba*. A generic application of Allen's Rule is not supported by the data.

GEOGRAPHIC DISTRIBUTION

36. Major Changes in the Bird Life of Southern Louisiana during Sixty Years. E. A. McIlhenny. 1943. *The Auk*, 60: 541–549. Prior to 1885 the Roseate Spoonbill, *Ajaia ajaja* (L.), was an abundant breeder; there is now a single small breeding colony in Calcasieu Parish. The Whistling Swan, *Cygnus columbianus* (Ord), and the Trumpeter Swan, *Cygnus buccinator* (Richardson), were regular winter residents before farming began; now the Trumpeter is gone and the Whistler is a rare winter visitor. Since 1905 the Mottled Duck, *Anas fulvigula maculosa* (Sennett), has increased in numbers as a nesting species; this is correlated with the decrease in the numbers of mink, raccoons, and alligators. The Swallow-tail Kite, *Elanoides forficatus forficatus* (L.), once a common nesting species, has disappeared and the Mississippi Kite, *Ictinia misisippiensis* (Wilson), has become very rare. The Eastern Red-tailed Hawk, *Buteo borealis borealis* (Gmelin), has recently become a breeding species. The Florida Red-Shouldered Hawk, *Buteo lineatus alleni* (Ridgway), always a breeder, was "never plentiful until about ten years ago." Attwater's Prairie Chicken, *Tympanuchus cupido attwateri* (Bendire), is now reduced to a single small flock. The Whooping Crane, *Grus americana* (L.), and the Sandhill Crane, *Grus canadensis tabida* (Peters), have become rare. The Upland Plover, *Bartamia longicauda* (Bechstein), was abundant when the prairies were grazed but occurs now only in small numbers. The Pectoral Sandpiper, *Pisobia melanotos* (Vieillot), has disappeared with the disappearance of cattle pastures bordering the bayous; the Long-billed Dowitcher, *Limnodromus griseus scolopaceus* (Say), has become rare because of unscrupulous hunting. The fall migration of Franklin's Gull, *Larus pipixcan* (Wagler), is about one one-hundredth of that of 1900. Passenger Pigeons, *Ectopistes migratorius* (L.), were abundant as late as 1882; the author's last record for southern Louisiana is 1896. His last record for the Louisiana Paroquet, *Conuropsis carolinensis ludovicianus* (Gmelin), is 1881; his last observation of the Ivory-billed Woodpecker, *Campephilus principalis* (L.), was in 1923. The Brown Creeper, *Certhia familiaris americana* (Bonaparte), was a regular winter visitor up to about 1910 but has now disappeared completely; the Blue-gray Gnatcatcher, *Polioptila caerulea caerulea* (L.), has also disappeared. The Southern Robin, *Turdus migratorius achrusterus* (Batchelder), was first observed to nest in coastal Louisiana about ten years ago. The Wood Thrush, *Hylocichla mustelina* (Gmelin), has gradually increased as a breeding species. Bluebirds, *Sialia sialis sialis* (L.), have not been observed to nest in the last twenty-five years. Starlings, *Sturnus vulgaris vulgaris* (L.), first appeared in 1924; the first Great-tailed Grackle, *Cassidix mexicanus mexicanus* (Gmelin), was recorded in 1917.

37. Notes on the Birds of Southampton Island, Baffin Island and Melville Peninsula. Reynold Bray. 1943. *The Auk*, 60: 504–536. The author was drowned on September 14, 1938 during his fourth visit to the Arctic. The notes published in this paper are those made by the author while a member of the British Canadian Arctic Expedition (May, 1936–September, 1937). Additions

are by T. H. Manning on the basis of his observations made during four years at Frozen Strait, Seahorse Point, and Taverner Bay. This paper will prove to be a valuable source of ornithological information for the eastern Canadian Arctic.

38. Birds of the Mackenzie Delta. A. E. Porsild. 1943. *The Canadian Field-Naturalist*, 57: 21–35. An annotated list of observations and specimens collected by the author in this area during the periods, April, 1927 to February, 1928 and October, 1931 to October, 1935. Because little was known of this area prior to the author's work this list with its excellent notes will be an important source of information for the Mackenzie Delta area.

39. Bird Notes from Southwestern Saskatchewan. L. B. Potter. 1943. *The Canadian Field Naturalist*, 57:69–72. These notes are the results of observation made during a residence of forty years near Eastend in southwestern Saskatchewan. Although based entirely on sight records the observations constitute a valuable contribution to the knowledge of the changes in avifauna in this region. Only a few of the interesting observations can be included in this review. The Lewis Woodpecker, *Asyndesmus lewis* (Gray), is described as an uncommon straggler from the west. There is an interesting account of the disappearance of the Magpie, *Pica pica hudsonia* (Sabine), from 1904 to 1910. The Yellow-breasted Chat, *Icteria virens* (L.), is listed as a newcomer of "twenty years ago;" several nesting records are given. The American Dipper, *Cinclus mexicanus unicolor* (Bp.), is recorded as a winter species on the southern slopes of the Cypress Hills where there are swift streams. Two other unusual records are the Clarke Nutcracker, *Nucifraga columbiana* (Wilson), and the Pinyon Jay, *Cyanocephalus cyanocephalus* (Wied). The latter is a sight record however Nutcracker was collected.

40. On Some British Columbia Birds. A. L. Rand. 1943. *The Canadian Field-Naturalist*, 57: 60–63. Notes on some birds observed and collected by field parties from the National Museum of Canada on the Central British Columbia coast. Additional notes from other sources are included.

41. Notes on the Birds of the Peat Bog at La Rogivue. (A la tourbiere de la Rogivue. Notes sur un marais de la Haute-Broye.) O. Paccaud. 1943. *Nos Oiseaux*, 167: 233–236. This paper contains notes on the nesting, visitant, and migrant species of a peatbog near the village of La Rogivue in the Canton of Fribourg, Switzerland, which lies on the main migratory route through this country. The paper is of particular value because the bog has recently been drained and the trees removed.

42. Summer Birds of Northwestern Wisconsin. Hartley H. T. Jackson. 1941–1943. *Passenger Pigeon*, Vol .3, Nos. 10, 11 and 12; Vol. 4, Nos. 2, 4, 5, 6, 10, 11 and 12; Vol. 5, No. 2. 36 pp. This paper contains many important observations and accounts of collecting records by Harry H. Sheldon, Arthur J. Poole, Dr. A. I. Ortenburger, Professor George Wagner, and the author during the summers of 1918, 1919, and 1920. It is of particular importance because of the paucity of records from northwestern Wisconsin. The annotations contain observations on the stomach contents of some of the species as well as other information. This paper will be an important source of information for northwestern Wisconsin.

BOOKS AND MONOGRAPHS

43. Waterfowl in Iowa. Jack W. Musgrove and Mary R. Musgrove. 1943. State Conservation Commission, Des Moines, Iowa. 122 pp. $1.00. This concise little book will provide sportsmen, amateur ornithologists, and laymen

with an authoritative, yet inexpensive and usable treatise on the 35 species of Iowa waterfowl. Eight color plates by Maynard F. Reece, with special attention to eclipse plumages, greatly enhance its usefulness. For each species there is a description of all plumages, and a paragraph on useful field marks in addition to information on calls, breeding range, migration, winter range, food, and status in Iowa. The chapter on plumage variations should prove helpful to those unfamiliar with the subject. There are also brief discussions on migration fly ways, enemies, parasites and lead poisoning. The keys with accompanying notes and diagrams should be useful. Its obvious merit and its remarkable price should make this publication very popular.

44. The Wild Turkey in Virginia: Its Status, Life History and Management. Henry S. Mosby and Charles O. Handley. 1943. Pittman-Robertson Projects, Division of Game Commission of Game and Inland Fisheries, Richmond, Virginia. 281 pp. This commendable book contains much more than the title implies. The first three chapters deal with the original and present status and range of the subspecies of *Meleagris gallopavo* (L.), in North America with a more detailed discussion of the history and present status of *M. g. silvestris* (Vieillot) in Virginia.

Originally the Wild Turkey was found throughout Virginia. According to the calculations of the authors it now occurs in 69 of the 100 counties. There is an occupied range of about 13,700 square miles, about 34% of the total area of the State. There are about 6.56 square miles of occupied range per flock of native wild turkeys. In 1937 there were 2,097 flocks with 23,237 birds; in 1938, 2,020 flocks with 22,575 birds. The authors estimate that the turkey can be reestablished in about 2,200 square miles of unoccupied range thereby increasing the total occupied range by 16%. The average annual kill (1927–1939, inclusive) is about 6800. Hence 1,293 acres of occupied range are required for each turkey legally killed.

There are interesting chapters dealing with the ecology and life history of the wild turkey in Virginia as well as an account of diseases and pathological conditions. There is an elaborate treatment of food habits based on stomach analysis (524 birds). Plant food comprises 95% of the contents in adult birds; the five percent animal food is largely insects. Unfortunately there are no data on the food of poults during the period of high protein intake.

The authors present evidence to indicate that the constant danger of domestication in the rearing of the Wild Turkey in captivity can best be prevented by the mating of captive females with wild gobblers enticed into the breeding pens. Although there are some favorable data, much more evidence is required to establish the adequate survival of game farm birds and the actual feasibility of reestablishing turkeys in the unoccupied range in this manner. Of further importance would be a comparison of the survival of pure wild populations with the survival of liberated game farm birds.

This important book will be an interesting and valuable source of information to conservationists, wild-life ecologists, game managers, and ornithologists.

45. The Biotic Provinces of North America. Lee R. Dice. 1943. University of Michigan Press, Ann Arbor. 78 pp. $1.75. The author introduces the system described in this book as "an experiment in classifying the major ecologic divisions of the continent." Because of the lack of sufficient data on the distribution of associations of animals and plants together much of the system is actually based on the distribution of plants. On the basis of his extensive field experience and a critical survey of the literature the author divides North America into 29 *biotic provinces* of which only the northernmost, the Eskimoan, is transcontinental. "Each *biotic province*, according to my definition, covers a considera-

ble and continuous geographic area and is characterized by the occurrence of one or more important ecologic associations that differ, at least in proportional area covered, from the associations of adjacent provinces. In general, biotic provinces are characterized also by peculiarities of vegetation type, ecological climax, flora, fauna, climate, physiography, and soil." It appears likely that the system may encounter difficulty in the mountainous provinces such as the Oregonian and Californian where considerable variations may occur within the province in temperature, rainfall, soil, flora, fauna, and climax associations. This is recognized and is at least partially remedied by the introduction of the *life belt*, "a vertical subdivision of a biotic province." "Frequently its distribution is not continuous, and thus a life belt may, for example, recur, under proper conditions of altitude and slope exposure, on widely separated mountains within one biotic province." It is stated that each life belt is restricted to a single province although "similar kinds of life belts" often occupy corresponding positions in adjacent provinces. Whether or not the importance of maintaining geographically continuous provinces is sufficient to relegate these altitudinal variations to the secondary order of "life belts" will become apparent as the system is subjected to application by other investigators. In reference to the classification of Clements and Shelford, "The concept of the biotic province differs from that of the biome, for a biome, if I understand its definition correctly, is coincident with its climaxes. Every area having the same climax, however far detached from the main area of that climax, seems, in the usage of Clements and Shelford, to belong to the same biome. A biotic province, on the contrary, is never discontinuous (except for marine islands), though ecologic communities somewhat similar to those characteristic of a particular province may exist far beyond its boundaries." There is a description of each of the 29 biotic provinces. A map shows the proposed limits of each of these provinces. In general the distribution of birds is not considered and ornithologists will doubtlessly be interested in testing the system from this point of view. This is an interesting book and is recommended to all who are interested in the ecology of birds. Doubtlessly the system will be modified as more information becomes available. Nevertheless it does establish a foundation for thinking along these lines.

46. Minnesota Wildfowl. Gustav Swanson. 1943. Conservation Bulletin No. 1. The Minnesota Department of Conservation, Bureau of Information, State Office Building, St. Paul 1, Minnesota. 31 pp. This bulletin is intended to present the layman with a non-technical introduction to the waterfowl of Minnesota. There are discussions of species, ranges, nesting habits, feeding habits, populations, management, and conservation. There are suggestions for the study of waterfowl by amateurs.

47. The Place of Winter Feeding in Practical Wildlife Management. Richard Gerstell. 1942. Research Bulletin No. 3. Pennsylvania Game Commission, Harrisburg, Pa. 121 pp. The author's conclusions on the role of winter feeding are based on a critical examination of the literature as well as some extensive experiments with several game species. Experiments with the Ringed-necked Pheasant, *Phasianus colchicus torquatus* (Gmelin), in which birds were subjecting to fasting at low temperatures showed that this species can go without food for two weeks or more during severe winter weather. Similar tests with the Ruffed Grouse, *Bonasa umbellus* (L.), although the number of experimental birds was small, indicate that this species is sufficiently hardy to withstand severe cold and lack of food for periods of several days. The Wild Turkey, *Meleagris gallopavo silvestris* (Vieillot), can endure one week of cold weather with no food; Hungarian and Chukar Partridges can endure similar conditions for four or five days. On the other hand the Bob-white Quail, *Colinus virginianus virginianus* (L.), is very

susceptible to severe cold and the lack of food. Resistance to cold and lack of food increases with the size of the covey. Semi-domesticated mallards can withstand simultaneous cold weather and fasting for a week or ten days. In all species the period of resistance to cold and fasting was substantially reduced when wind was introduced as a third factor. Attention is also given to the problem of fecundity after winter fasting periods. Preliminary experiments with pheasants in which the breeding birds were fasted for eight days in March and six days in April, showed that this amount of fasting which resulted in substantial losses in weight affected neither the numbers of eggs produced nor their fertility. On the other hand winter ood shortages seem to have a distinct effect on the reproductive capacity of the Bob-white Quail. Lack of drinking water in liquid form is not an important factor in the survival of any of these species. The author's experiments confirm earlier observations that gallinaceous birds can retain grit in the gizzard for several weeks and are able to subsist two months or more in the absence of available grit without ill effect. With the exception of the Bob-white Quail these experiments and observations indicate that winter feeding is of no practical value in the management of gallinaceous game birds.

48. Studies in the Life History of the Song Sparrow II. The Behavior of the Song Sparrow and Other Passerines. Margaret Morse Nice. 1943. Transactions of the Linnaean Society of New York, VI. viii + 329 pp. $2.00. (Address: c/o American Museum of Natural History, New York 24, N. Y.) Volume I of these studies (1937. Trans. Linn. Soc. N. Y. IV) concerns "A Population Study of the Song Sparrow," dealing "with vital statistics of a group of Song Sparrows at Columbus, Ohio: their weights, migrations, territories, nesting success and failure, and the survival of adults and young. Comparisons are made with other species, but the work is chiefly concerned with a sample population of *Melospiza melodia*." (p. 1.) Volume II treats of the behavior of the same group of wild Song Sparrows with the addition of detailed work on a number of hand-reared birds of this species and other Passerines. Comparisons are made with many other works, not alone on bird behavior but on animal psychology in general (the bibliography contains 730 titles) and there is much discussion of theories of behavior and psychology. Each chapter contains the original findings of the author correlated with those of others and discussed in the light of the important theories on the subject of the chapter. When it concerns young birds, material is presented both as to the behavior of the hand-raised birds and observation of wild ones. As in Volume I of these studies, the reader is greatly helped in the assimilation of the wealth of information and ideas contained in the book by compressed summaries at the end of each chapter. To give the gist of the work a reviewer could find no better method than to reproduce sections of these summaries.

"The point of view is fundamentally that of Lorenz, Heinroth and Tinbergen," the author states (p. 4); but other opinions are presented and discussed. "Birds 'have kept instinct as the mainstay of their behavior'; they are 'emotional animals', yet learning plays an appreciable role." "Instinctive action is defined as an inherited type of coordinated movement," while "learning 'can decide the question, whether and with what intensity in an individual case a certain instinctive act will be released'." (Lorenz).

There are five stages in the development of the young Song Sparrow from hatching to independence: (1) rapid growth and start of feather development, days 1–4; (2) establishment of temperature control, days 5–6; (3) rapid development of motor coordination, days 7–9; (4) leaving the nest, acquisition of flight, days 10–16; (5) from attainment of flight to independence, days 17–29. "Precocial birds might be considered as passing stages 1, 2 and 3 in the egg; at hatching a Bob-white is comparable in many respects to a Song Sparrow that has recently

left the nest." "The regularity in the order of appearance of most of the activities in healthy young Song Sparrows is striking. Much the same order of appearance of activities was found in representatives of 5 passerine families." Innate and learned modes of behavior of the young bird are presented and it is pointed out that "learning is largely concerned with the object of the instinctive actions." For instance, "flying is instinctive and is not learned, but expertness in landing has to be acquired by many birds."

"There are four chief ways in which a Song Sparrow may respond to other birds of its own and other species: ignore them, be attracted to them, drive them, or retire before them. These responses differ according to the season of the year." The development from "supersedence" to "peck-right" in the case of the hand-reared birds is shown and, as regards the sociality of the species the author concludes that "although the Song Sparrow is only slightly gregarious, yet it shows the basic mechanisms for social integration."

Chapter VIII deals with awakening and roosting which leads naturally to "one of the most unusual characteristics of the Song Sparrow which is its individuality in song. Each male has a number of different songs—6 to 24—that with a few exceptions belong to him alone. Despite this remarkable variety they are almost always recognizable as coming from this species." (p. 115). Females "occasionally sing early in the season before nest-building begins." Generalizing on the subject of female singers the author suggests that song might be innate in both sexes, in the course of evolution having developed in two lines; in one the "male developed the more elaborate song, in the other the female." The young male has a beautiful sort of *ad lib* warbling song, (uttered as early as on the 14th day. Young of 16 species have been reported as starting to sing at 13 to 24 days.) which becomes fixed and stereotyped in the definite repertory of the adult. Some songs may be sung by more than one individual but the author could find no proof of relationship correlated with this. Experiments on the inheritance of singing in Passerines show that whereas the song pattern of a species is innate the quality of an individual singer's song may be formed by imitation.

"Territory is of fundamental importance to the Song Sparrow, the basis of its individual and social life for more than half the year. This species may be considered a typically territorial bird, following closely the pattern of the Reed Bunting as described by Howard (1920, 1929)." (p. 151.) "Territory requirements are not rigid for the Song Sparrow; so long as he has cover and singing posts, a large variety of habitats will be accepted." This adaptability of the species has "permitted pioneering of somewhat diverse situations," the author quotes from Miller (1942). It has led to the breaking up of the species into about 28 races in North America, whereas the Lincoln Sparrow, of the same genus, adheres to "certain type of fresh-water marsh," thus thwarting intraspecific geographic variation (p. 152). The male Song Sparrow sings his advertising song from his territory as a distance threat to other males and an invitation to females. Trespassers are pursued; boundaries are defended by "ballooning" (also used by females); a male attempting to regain usurped territory goes into "puff-sing-wave display." Both males and females "show a high degree of faithfulness to their nesting territories." Both sexes drive other species from their domains, even those more than twice their own weight. "Nevertheless several of these species nested freely among the Song Sparrows."

Mrs. Nice uses the definition of territory as "any defended area." "The territorial incentive is predominant in both sexes in much of the defense against males and other species, but some of the fighting is certainly sexual." "The chief functions claimed for territory have been: food value, limitation of the numbers of a species in an area, protection against interference in the nesting cycle, assistance to pair-formation. All of these are true in some cases but not in all. They are certainly true for the Song Sparrow."

"The male Song Sparrow's 'courtship display' consists in 'pouncing,' *i.e.* he flies down, hits the female and leaves with a loud song. This occurs during the early stages of the nesting cycle, but ceases with the start of egg laying." "There is a definite bond between the pair; the birds are attached to each other during the nesting season, so long as they are closely associated." But "the male pounces on his neighbors' mates when they are temporarily unprotected. The female normally responds (in such a case), by fighting. This habit of the male is the occasion for many fights. It also opens the way for bigamy when an incubating female loses her mate." "Females are hostile toward neighboring females, using the threat-posture, threat-note and fighting."

"The problem of pair formation is primarily that of recognition. . . specific and sexual," the author states in considering the problem in general (p. 192). "With some birds the recognition of possible mates is an inherited matter (*e.g.* Cowbirds), with others the mating preference is acquired." Pair formation cannot be discussed without touching upon "dominance" and this author goes into this matter most clearly and comprehensively. "Social dominance is something that can be observed and measured; sexual dominance is a postulate that might well be discarded until thoroughly studied. If the male drives or pecks or pounces on the female, these activities are his signals that he is ready for pair formation or copulation. The female signals by posturing, trilling, etc. We do not have to say that one set of actions expresses dominance and the other submission. After all, in nature the female is free to come or go. If she really feared the male, she would stay away from him" (p. 199). The reviewer feels that this clears up a good deal of misinterpretation on this subject. "Many birds (including the Song Sparrow) respond differentially to the sexes, hence may be said to discriminate the sexes." This discrimination may come about through sex dimorphism or through behavior, as with the Song Sparrow, even though in some cases upon *first* encounter a male may not treat an approaching female as such.

The concluding chapters concern the nest, the eggs, care and defense of the young. Under enemy recognition Mrs. Nice concludes that "Owls are recognized by Song Sparrows largely through an inborn pattern, Hawks through their rapid movements, and cats and cowbirds through conditioning." In the final chapter the author says: "There are beginnings of primitive culture among birds and infra-human mammals, experience being handed down non-genetically from generation to generation, particularly in matters regarding protection from enemies."

One may feel confident that this extremely important and stimulating work more than fulfills the author's hope that it will "serve as a guide to the study of bird behavior, showing, as it does, the general pattern of development and broad outlines to be expected, and giving a viewpoint and technique which should help others to intensive observation and study" (p. 3). Rather one believes it to be a standard for all future students to strive for. Probably wartime conditions are responsible for the more than usual crop of typographical errors that mar the book's pages.—Laidlaw Williams.

WHO HAS THESE BANDS?

The Fish and Wildlife Service has requested the coöperation of bird banders in locating a considerable number of bands that do not appear in the Service's issue index.

The quantity and numbers of the missing bands are:

100 bands size 2.	39-247001 to 39-247100
200 bands size 3.	40-321701 to 40-321900
10,000 bands size 6.	B677001 to B687000

Since recovery records from some of the above series have been received, the Service is especially anxious to locate the station operators to whom they were issued.

Please examine your bands and records, and if you find that you have or have had any of the bands numbered in the groups listed, please notify the Service so that their records may be corrected.

BIRD-BANDING

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